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BULLETIN OF THE ATOMIC SCIENTISTS

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Editorial

HOW TO LOSE FRIENDS

THE scandalous treatment of distinguished foreign scientists by American immigration authorities was mentioned in the *Bulletin* two months ago in connection with the international meetings of scientists and physicists in New York and Chicago last fall. Several visitors with the highest reputation in the world of science, to whom no anti-American or pro-communist activities could be imputed, were at that time either refused admittance or left waiting for a visa until it became physically impossible for them to attend.

These incidents have been extremely damaging to America's reputation among scientists (and intellectuals in general) all over the world—and helpful to those who want America to be looked upon as a country ruled by reactionaries who fear "subversive" foreign thought as it was feared by Japanese rulers before Commodore Perry, or by Muscovite czars before Peter the Great.

In the past, such administrative excesses have been rapidly corrected once they were exposed to public ridicule. In the present case, however, the revelation has had no salutary effect; to the contrary, the blunders of the visa authorities have become more numerous and more grotesque with every passing month.

I

Out of the long roster, we would like to describe three cases. One of them has been rather widely discussed in the press—the case of Dr. E. B. Chain, one of the three scientists who received the Nobel Prize for the discovery of penicillin. Dr. Chain has been refused admittance to the United States twice, the first time when he was on a study tour for the World Health Organization of the United Nations. Dr. Chain said that he has never been active in political movements, and nobody has contradicted him. However, this British scientist is a German refugee, and he once helped to set up the production of penicillin in one of the satellite countries. These facts must have been considered sufficient cause for suspicion to expose this benefactor of mankind to the humiliation of being twice refused admission into free America, and to insult in his person the most uncontroversial humanitarian agency of the United Nations.

II

The second case is that of Professor Michael Polanyi. Professor Polanyi, too, is a naturalized Britisher and thus belongs to a group which, perhaps, the treachery of Klaus Fuchs has made particularly suspect in the eyes of security-obsessed officials. He was born in Hungary, but early became a professor of physical chemistry in Berlin; when Hitler came to power, he moved to the University of Manchester, England. An outstanding physical chemist, he has, in recent years, given an example of universality unique in the present age of specialization, by exchanging the chair of physical chemistry at Manchester for that of economics in the same school.

Professor Polanyi has been particularly interested in the philosophy and psychology of science. He has lectured on this topic as guest professor at the University of Chicago in 1950; and the University of Chicago has now asked him to join its faculty permanently. He resigned his position at Manchester, and was to move to Chicago in September 1951; but his application for a visa, made in January, was still unanswered by December, when he got tired of waiting and resigned his appointment in Chicago. The University of Manchester was delighted to have him return to his old chair.

What makes this case particularly incredible is that Dr. Polanyi is known as a militant opponent of planning in science as well as in economy. He founded the Society for Freedom of Science, to combat the widespread influence among British men of science of communist-influenced groups favoring government direction of science toward practically important goals. Polanyi is an unreconstructed believer in the liberal nineteenth-century philosophy of scientific progress. He believes that the maximum benefits of science to society can be obtained by letting individual scientists explore nature completely freely, and without thought of immediate practical advantage.

Polanyi's economic ideas also are rooted in a belief in the supreme value of the individual. This made him a foe not only of communism, but even of milder forms of planned society. His ideas have been developed in articles, lectures, and books, well known to scholars here and abroad. To the American visa officials, however, Polanyi's public record seems to be unknown or unimportant. According to rumors—and, unfortunately, we have to rely on rumors, since no authoritative explanations of the decisions (or indecisions) of the visa authorities are ever forthcoming—these authorities are instead, concerned with the fact that Dr. Polanyi has a relative in the United States whose political views are of the wrong kind.

III

The third case is that of a group of Mexican physicists. A regional meeting of the American Physical Society was held in December 1951 in Houston, Texas. The Society considered this a good opportunity to invite physicists from Mexico—who had played generous hosts to a society meeting at Mexico City earlier in the year—to visit the States and tell their American colleagues about their researches. The distinguished Mexican physicist, Professor Vallarta, was to be one of the leading speakers of the session. Professor Vallarta has served as the representative of the Mexican Government in the U.N. Atomic Energy Commission; as one of the few scientifically qualified members of this body, he has taken active part in the elaboration of the American proposal for international control of atomic energy into the detailed U.N. majority plan, supported

by the U.S. and by all nations except the Soviet bloc.

In accepting the invitation to Houston, Professor Vallarta asked for permission to bring with him three colleagues, to make possible a comprehensive report on the activities of Mexican physicists. This suggestion was gratefully accepted by the Physical Society; but when the time of the meeting approached, it turned out that two of Professor Vallarta's coworkers were unable to obtain visas—upon which Dr. Vallarta and the fourth member of the Mexican delegation refused to attend. Other Latin-American countries have been similarly offended by the refusal of American consular authorities to grant transit visas to several distinguished scholars from Europe en route for these countries.

In this manner, the policy of American visa authorities wrecks not only cooperation with the free nations of Europe, but the Good Neighbor policy in Latin America as well.

All these deplorable blunders are blamed on the McCarran "Security" Act of 1950, passed by Congress by overwhelming majorities, despite the veto of President Truman. This bill provides for refusal of admission to the United States to any alien who has at *any time* in the past belonged to a group or organization advocating the overthrow of legal government by force. The Act threatens with imprisonment any American who assists an ineligible alien in obtaining admission to this country.

It is claimed that because of this threat, American consular officials, for their own protection, must refuse admittance to anyone unable to prove that he has never belonged to a "subversive" organization—a requirement practically impossible of fulfilment, particularly for those who have spent part of their lives under a totalitarian system, where every scientific, athletic, or professional organization must needs subscribe to the tenets of the party in power.

If one takes into consideration the fact that the consular authorities cannot ask for an "FBI clearance" of visa applicants, since the FBI has no authority to carry out investigations outside America, even in friendly countries, it becomes understandable why the desks in the visa department in Washington are rumored to be heaped with visa applications gathering dust. Yet, if the whole procedure is not to become a cruel joke on a prospective lecturer or visitor to a congress or conference, he has to receive an answer to his application within a few days—a couple of weeks at the utmost. Without rhyme or reason, foreign scientists asking for only a few days' stay in America, and whose visits may be intended primarily to acquaint American scientists with the research they have carried out abroad, are screened according to the same standards as applicants for positions of confidence in secret government work in this country—standards that include freedom from "past deviations," from "guilt by association," and from "guilt by family relation"!

According to a newspaper story on December 9 the top men in the State Department have now decided that subjecting distinguished visitors from abroad to an insulting and degrading experience is not in the best interest of the United States, and that an amendment of the McCarran Act must be sought which would permit faster and more enlightened treatment of visa applications. However, it was also reported that the visa authorities within the State Department are opposed to such an amendment, and want to carry out the McCarran Act in letter as well as in spirit.

When the McCarran Act was passed, and newspapers began to carry stories illustrating the disastrous consequences of its sweeping provisions, which denied admission to this country to many militant anti-Communists, Senator McCarran and his friends accused the State Department of deliberately misapplying the act in order to discredit it.

The refusal of Congress to listen to sensible arguments in matters involving real or imaginary "national security" makes this theory not entirely incredible. However, even if this is the hidden rationale of the growing series of decisions (or indecisions) exposing America to the contempt and ridicule of the non-communist world, and undoubtedly causing communist propaganda chiefs to rub their hands in gleeful satisfaction—this game of *reductio ad absurdum* has now gone too far. The State Department must not only push vigorously for an amendment of the McCarran Act, but, in the meantime, take full responsibility for fast and sensible decisions on visa applications.

We would like to see an American consul brought to trial, or the Secretary of State impeached, for granting a visa to a Polanyi, Chain, Oliphant, or Peierls!

—E. R.

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A PROTEST AGAINST VISA SITUATION

The concern of American professors with the restrictive legislation hampering the entry into the United States of distinguished foreign visitors is expressed in the following letter to Chancellor Kimpton by three University of Chicago professors. Mr. Kimpton has endorsed these views and forwarded the letter to Secretary of State Dean Acheson. Samuel K. Allison is director of the Institute for Nuclear Studies Cyril S. Smith is director of the Institute for the Study of Metals; and John U. Nef is professor of economic history and chairman of the Committee on Social Thought.

December 21, 1951

Mr. Lawrence A. Kimpton
Chancellor
The University of Chicago

DEAR MR. KIMPTON:

The undersigned are deeply concerned with the adverse effects on the intellectual life of this University and the country resulting from certain provisions in the *Subversive Activities Control Act of 1950* (the "McCarran Act"), and we urge that you make a protest to appropriate United States legislative and administrative officers who might be able to encourage and effect amendment of the Act. Under the provisions of the Act visas have frequently been denied—or at least delayed for extreme lengths of time—to scholars and scientists desiring to visit the United States or to emigrate to it. We have direct knowledge of many cases in which the enforcement of the Act has deprived the United States of the knowledge and experience of prominent scholars, and has most seriously damaged the reputation of our country for the maintenance of intellectual freedom.

It has become very difficult for a reputable university in the United States to invite foreign scholars to participate even temporarily in the intellectual life of the institution and this at a time at which a feeling of communion among the universities of the free world is greatly to be desired. We are losing contact with the scholarship and ideas of the world outside us. The whole course of history has shown the internationality of knowledge and the importance of fertilization of ideas developed in different environments.

To our amazement we find that our doors are shut in the face of an eminent physical scientist invited for a week of scientific meetings, and that a celebrated political and social philosopher, who has accepted a chair at our University, has not been granted a visa twelve months after his initial application. These are by no means isolated cases; on the contrary, they are typical of what is happening throughout the scholarly world.

We are spending vast sums to keep secret those defense activities which must be classified, and these newcomers here, just as any citizen, would be warned away from classified areas, and prevented from learning these secrets. The very idea of the guards and the restrictions is that there should remain in our country areas of freedom in human activities, in which people may freely speak their minds, and regions in which they may travel, visit, and observe according to their interests. Unles such freedoms are left in our country, a very important purpose of the guards and the barbed-wire fences has not been realized.

The legislation of which we complain is bad because it is written as if every visa applicant, rather than one in a hundred thousand, should be seriously suspected as a person whose presence here would be detrimental to the best interests of our country. This suspicion, obviously underlying the incredibly involved clearance procedures exasperates and humiliates every visa applicant. Furthermore, the Act is not written in such a manner that it can be successfully administered. The investigations demanded concerning each visa applicant are so far-reaching and detailed that months and months, even years, are required to clear an applicant for a ten-day visit. We know of many cases in which the embarrassment and humiliation of an applicant has spread in the form of anger through his friends and associates, who know perfectly well that he is a person of integrity. We have an example of a case in which the entire delegation from a foreign country refused to attend a meeting of a learned society in sympathy with the treatment of some of its members. Such cases legitimately raise the question whether ours is the land that fosters freedom, tolerance, justice, and respect for the individual.

Our country is strong enough to hear itself criticized, if visitors and immigrants care to criticize us. Our security agents are now alert and able to conceal those activities which must be kept from unfriendly eyes. We should not set a shameful example to

(*Continued on next page*)

THE STATUE OF LIBERTY SPEAKS...

in 1901

..."Give me your tired, your poor,
Your huddled masses yearning
to breathe free,
The wretched refuse of your
teeming shore.
Send those who are homeless,
tempest-tossed, to me,
I lift my lamp beside the golden door."

(These are the actual lines written by Emma Lazarus, and inscribed on the pedestal of the statue.)

in 1951

..."Now that I've licked the world
and drained your store
Of knowledge, I might have to spurn
The scientists I welcomed here of yore;
The times are changed; besides those
guys might learn
Something from me! I slam the golden
door."

—G. SAWER

Australia, 1951

in 1941

..."Give me your battle lore;
Send Oliphant with radar,
Whittle's planes;
Florey with penicillin;
send Niels Bohr,
Penny and Chadwick; all of
Freedom's brains
Will scarce suffice to guard
my golden door."

NOTE: The above poem, written by Geoffrey Sawer, was largely inspired by the visa difficulties which kept Dr. Marcus Oliphant from attending the international physics conference in Chicago in the autumn of last year. Mr. Sawer is a professor of constitutional law at the Australian National University.

For the benefit of the *Bulletin*'s lay readers, it might be explained the names mentioned are those of Oliphant, distinguished Australian physicist; Air Commodore Sir Frank Whittle, who developed the jet plane for England; Sir Howard Walter Florey, pioneer of penicillin research (see editorial on preceding pages for note of visa difficulties of Florey's penicillin colleague, Dr. E. B. Chain); Niels Bohr, Danish physicist; and Dr. William George Penney and Sir James Chadwick, again from England. Oliphant, Penney, Chadwick, and Bohr all worked at Los Alamos and other U.S. research centers during the war.

(*Continued from page 4*)

the world of panic and hysteria, and it is only in such an atmosphere that the legislation we refer to could have been enacted.

We urge that action be taken to replace the objectionable McCarran Act with a set of carefully considered and workable regulations concerning the granting of visas. Regulations should not be drafted in an atmosphere which considers as the motivation for every visa application a desire to injure the United States. It would also seem to us that legislation of this sort should not be formulated without the advice of those who will have to administer it and those who have had wide experience in the visa problem.

With the above letter signed by the three professors, the University Chancellor sent to officials of the Department of State, and others, this covering letter:

January 7, 1952

DEAR MR. ACHESON:

I am transmitting a letter, signed by three members of the faculty of the University of Chicago, concerned with the effect of the Subversive Activities Control Act of 1950.

I believe that a year of experience with the Act provides strong arguments for a careful review looking toward its amendment, as my associates on the faculty recommend. Because of this legislation, the University of Chicago has been denied the services, either temporary or permanent, of men of high qualification. Other educational institutions have been similarly limited. The free exchange of knowledge and ideas which this country has always prized has been curtailed.

Since it would seem possible to achieve the primary purpose of the Act without the present harassing and unnecessary provisions, I hope you will direct your earnest efforts toward its reasonable amendment.

Very sincerely yours,

LAWRENCE A. KIMPTON

Chancellor *University of Chicago*

An Interview with Senator McMahon

Chairman

Joint Congressional Committee on Atomic Energy

Herewith is presented an interview with the chairman of the Joint Committee on Atomic Energy, a Senator perhaps more than any other personally known to many readers of this journal.

As will be seen, the Senator recalls vividly those days in 1945–46, when the Federation of American Scientists—and many other groups and individual scientists—were active in Washington on behalf of civilian control of atomic energy. Accordingly, the "interview" might better be described as a "conversation," for the Senator was also in search of information from the interviewers.

Present were Eugene Rabinowitch, Editor of the Bulletin; *T. Harrison Davies and John A. Simpson, Jr., members of the Editorial Board of the* Bulletin; *Michael Amrine, Managing Editor; Peter Axel, News Editor; and Mrs. Alan Simpson, Assistant Editor.*

It is no novelty for a group of Senators to quiz a scientist, but the Bulletin *believes this is one of the few times a group of scientists has ever had the opportunity to throw questions the other way. Had the "victim" been some Senator other than "the atomic Senator" from Connecticut who is well known for his attempts to understand the issues of science and society, this meeting might have become just another one of those tortuous sessions in which professors and legislator failed to find a common tongue.*

We know our readers will be interested in the following exchanges of views on the subject of the National Science Foundation and the support of science by government, the role of scientists in politics, the question of making "stockpile information public," civil defense and dispersal proposals, the tactical bomb and—among other subjects—the attitude of the military toward budget economy and the attitude of Brien McMahon toward the seniority system in the Senate.

MR. DAVIES: Can you suggest any special area in which the *Bulletin* ought to become active now? Any particular thing that we should try to do?

SENATOR MCMAHON: Yes—I would think that there is quite a job for the scientists to do, for example, in the way of getting more understanding in the Congress of the National Science Foundation and what it is set up to do. I said in my speech last night [address at the American Institute of Physics, October 25, 1951] that I thought that the way Congress had hacked the appropriation demonstrated a complete lack of understanding of what is necessary in a scientific way in this country.

I had never seen, to the best of my knowledge, Dr. Alan Waterman, who, of course, as you know, appeared before Congress for the National Science Foundation. Now I don't say that in criticism of the doctor, whom I have never met before, but simply to point out that he lives in Connecticut. He lives in my state; he has taught for many years at Yale University; and here he has a job to do—to get money out of the Congress, and he was so naive that he did not get around and contact the senators personally. In fact, someone from Princeton spoke to Senator Smith of New Jersey about it, and Smith came to me.

As I pointed out to Waterman later, we are so burdened, so harried, with forty times more than we can do, that unless someone comes to us and pounds on us, it is just not possible for us to be looking for things to do, to say nothing of doing them. What I am trying to say is that a poor public relations job has been done by the National Science Foundation, and I think the scientific fraternity has to share some of the blame because you cannot expect the Congressmen, burdened as they are, to appreciate that the money we would put into the National Science Foundation would be put to our best interest in the business of security.

I would definitely say when you ask me what the best thing you can do at the moment is to try to carry on a widespread campaign of education, both in writing and by personal contact with the men in the Congress as to what science needs. You should not be too critical of Congress. The American people do not and cannot understand what has happened in the Congress of the United States, with all these tremendous additions to our budget. So if you've got a program, no matter how good it is, you've got to bring it to Washington and sell it there.

MR. RABINOWITCH: Do you think that there is any chance that in consideration of the new burden on Congress, there could be achieved a better distribution of work between people in Congress, so that those who are interested, or whose training is more adequate for this particular job, for example, would have a better chance of influencing the decisions? Would it not be possible, for example, to have in the Joint Atomic Energy Committee people who have some interest or competence in atomic energy affairs?

SENATOR MCMAHON: Well, I'll tell you a story. John Foster Dulles had, of course, considerable experience in

things diplomatic for many, many years. When he came to the Senate, the suggestion was made by the uninitiated that it would be desirable to have him on the Foreign Relations Committee, where there was a vacancy. That was strictly an idea of the columnists and gave them something to talk about. He never had a snowball's chance in hell of being on the Foreign Relations Committee—because it is done by seniority.

There is no chance of changing this system and, believe me, I don't think there should be. It is the lesser of two evils. I have been in the Senate now for some seven years, and the seniority system is the only feasible way to operate in Congress, because if you ever started to choose committees by election, it would become the greatest log-rolling session of the ages and just wouldn't work.

MR. SIMPSON: If I remember correctly, there is one exception to that, and that was when you became chairman of the Joint Committee on Atomic Energy in 1945.

SENATOR MCMAHON: John, that was an exception in a sense, but there is a tradition that anyone who introduces a resolution to set up a new committee is appointed chairman, and that was, of course, how I became chairman.

THE SCIENTIST IN POLITICS

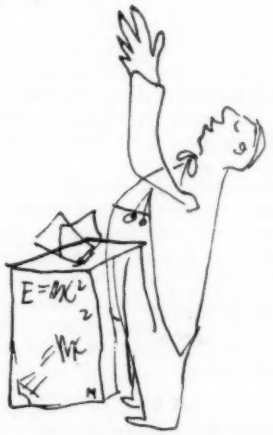
MR. RABINOWITCH: I don't know whether you noticed in Dr. Klopsteg's speech at the Physics Institute dinner [October 25, in Chicago], the reference to scientists who suddenly felt themselves experts on statescraft. This is the kind of feeling we often encounter among our colleagues—a slightly ironical attitude toward those scientists who go to Washington and try to influence political decisions, even if these are related to science. I wonder if you would care to say something about your experience with scientists in politics? Do you think they should stay away from it?

SENATOR MCMAHON: I have always given the scientists a good deal of credit for the results that were achieved in 1946 in the way of atomic energy legislation. I believe that if we —those few of us in the Senate—had not had at that time the support of the scientists, the atomic energy bill could not have been made into law. I further believe that under that law we have at least twice as many bombs as we might have had had we left atomic energy under the previous management. Therefore, where scientists became amateur statesmen, they made a very definite contribution to the country's defense.

That I don't agree with every one of them and every one of their attitudes and everything they say, goes without question. I wouldn't expect to, nor do they agree with everything I think about things, but I must say that, being men of intelligence, of high intelligence, they can be very effective. I have noted reference in Mr. Forrestal's *Diaries* about the scientists who were eager to take all secrets out of the country to Moscow. How did he put it?

MR. AMRINE: Giving it away; by "it" meaning the whole bundle of secrets.

SENATOR MCMAHON: Well, I found no such disposition in any atomic scientist that I had contact with, and I had contact with most of them in Washington. There was some propaganda put out from time to time that this was the attitude of the scientists by those who, for their own purposes, wished to discredit scientists because scientists were engaged in an activity not pleasing at the moment to those who wanted to keep control of the whole thing.



MR. AMRINE: We used to have that from two ends—it used to come out of the Pentagon or Manhattan District, and it used to come out of the Communist party circles at the other end. They were both interested in seeing that the scientists were pictured as wanting to give atomic energy secrets to the Soviet Union. These two kinds of people were feeding this idea into the channels of public opinion, while the Federation of American Scientists [FAS] tried to keep the record straight.

THE SCIENTIST'S ROLE IN INFLUENCING CONGRESS

MR. RABINOWITCH: Speaking of the *Forrestal Diaries*—they leave the impression that even at the highest cabinet level at that time, the whole atomic bomb question appeared in this light: "Shall we give the secrets away, or shall we keep them?" The scientists were trying to emphasize that this was *not* the main question, that the essential questions were on quite a different plane—what America should do in anticipation of inevitable development of atomic weapons by other nations—and it seems to me that even such intelligent people as Forrestal were not aware of this. Bernard Baruch said, "Science should be free, but not so free as to destroy the world," as if this is what scientists were after!

MR. AMRINE: Could you make any suggestions as to how the best scientific advice could reach the highest echelons in government? Apparently, it did not really get to Forrestal and to the cabinet meetings that he describes, and we see decisions still being made, apparently without real regard for known scientific facts.

SENATOR MCMAHON: Well, I know of no better suggestion to make than to have scientists come to Washington as frequently as they can and to talk as frequently as they can with members of the House and the Senate, and men in government agencies and get their points across to them.

MR. AXEL: One of the difficulties that came up with the National Science Foundation program was that there were two groups of scientists involved. First, the FAS, whose aim is to educate Congress and, on the other hand, the much more prominent advisers appointed by the President. I wonder whether these advisers, such as the NSF Board, were supposed in some way to influence the legislature.

SENATOR MCMAHON: If that was their job, they have not done a very good one.

MR. AXEL: I wonder whether you think that whenever any scientific legislation comes up, despite the existence of any formal committee set up by the President, independent scientists ought to go in and do their best?

SENATOR MCMAHON: Time will not permit everybody who wants to, to come and speak, but certainly if there is an organization like the Federation,

it should have a spokesman on any bills or appropriations having to do with scientific matters, and you ought to make your viewpoint known. This association represents—I don't know how many, but I know it is a great number—of men in this particular field. If it was the job of the agency appointed by the President to contact the legislature, the individual members either did not understand it so or, if they did understand it, did not do the job.

MR. AXEL: I don't know whether they thought it was their job. They went to talk with Waterman, and Waterman wanted no publicity. People who saw him got the feeling that scientists should not exert pressure and look like a bunch of radicals—or people looking for special favors.

APPROPRIATIONS FOR SCIENTIFIC RESEARCH

MR. SIMPSON: At the present time, there are insufficient funds in the National Science Foundation. AEC, in anticipation of a reasonably well-endowed NSF, cut back on the program for predoctorate fellowships. In view of this and of the great need for scientists—we are already short of an equivalent of eight to ten years' crop in our engineering manpower because of policies adopted during the war—what can we do to correct this situation without waiting until next year, when we could again go after a better endowed NSF? We are faced with insufficient scientific training budgets, both in the AEC and in the NSF, and we have an ever-increasing demand on the universities for the very limited funds they have—funds that become at least 10 per cent smaller every year.

What is there we can do in this present situation so that universities can do the job of turning out all the scientists and engineers that your committee will ask for if the AEC expands as you propose it should expand? The scientists needed for this expansion do not exist now; they are not being trained now.

SENATOR MCMAHON: I certainly hope that the Atomic Energy Commission will bend every effort to hold the line in this interim period until the NSF gets more money. What you say, John, indicates the necessity for a campaign of public education on the necessity for "seed corn" in the scientific world.

I spoke several weeks ago on an off-the-record basis to about two hundred fifty editors of business magazines, and their staffs, and of course, they are intensely interested in things of this kind. I touched on the necessity of really getting behind the program of further aid for scientific education. I think the *Bulletin* might well look around for groups to which you might send speakers to talk at their meetings. There is not much use going to any old club. I mean, they'd listen to you, but not do anything about it, and could not do anything about it. But if one of your representatives had been at the editors' meeting and said, "Now here's a situation that has to do with your welfare and your business," you would have been able to gain considerable support.

The best suggestion I have would be to catalog carefully the groups who have a particular interest in scientific and technical manpower, who have the intelligence to appreciate the importance of this subject, to speak to them and see if they cannot be induced to contact their friends in Congress.

MR. SIMPSON: You mentioned that you thought the AEC should make an effort to tide over the present period. Do you think that there is anything that scientists who have connection with the AEC can do to point out more clearly what the AEC might do by way of an expanded training program? Such an expansion would not more than two or three bombs. The money that goes into two or three bombs could produce a lot of trained scientists. The question is: which is more valuable during the next twelve-month period?

SENATOR MCMAHON: Well, I would certainly see to it that any presentation you wanted to make to the Commission, either orally or in writing, would receive attention and consideration.

MR. RABINOWITCH: The Office of Naval Research, which is supporting some of the research work in which I am presently engaged, is getting more careful and more pressed for funds and feels that now that we are confronted with immediate problems in connection with mobilization, they cannot be as free as they used to be in supporting fundamental research. I wonder whether your Atomic Energy Committee could go on record, officially or unofficially, that they'd like such offices as the AEC and ONR to keep up their support of basic research?

SENATOR MCMAHON: This gives me an idea about a supplemental report from our committee bearing upon questions such as this. We do have in our committee's report a very direct avenue to the American people. We might get out a report appraising the scientific situation in the country and its relationship to the atomic problem. Such a report would have to cover the entire science program. I think it may be worth doing.

SCIENTIFIC MANPOWER

MR. SIMPSON: A year ago, the Office of Naval Research, when it was under the direction of Waterman, made a very specific statement. It said that basic research would be held at its present level, but would not be expanded and that the programs which are dropped will not be replaced at other institutions. The total income of ONR is slowly going up, but this increase is going into military applications so that, percentage-wise, the situation is becoming worse. Can your program for making more atomic weapons for surface and undersea atomic propulsion be carried out without properly trained men to put on the job?

MR. AXEL: Do you have any feeling, when you speak of a six-billion-dollar atomic program, how many trained scientists such a program would require? How much of that money will be spent on production and engineering?

SENATOR MCMAHON: I think most of it would go into production and engineering. I would not think that the lack of well-trained men would be too serious in an extension of the atomic program in the next couple of years. It would be more serious in certain other fields now, and in the atomic field later on.

MR. RABINOWITCH: In your speech at the Institute of Physics banquet, you appealed to scientists to come and help, in the new program, and then immediately afterwards you said that if they were engaged in basic research, they shouldn't drop it. Obviously, you can have both things going strong only if you increase the total supply of new scientists.

SENATOR MCMAHON: I am perfectly aware that you need both—perfectly aware.

THE RELEASE OF STOCKPILE INFORMATION

MR. DAVIES: I'd like to ask a question which would change the direction of the conversation; it may be something you really don't want to comment on, in which case I shan't feel hurt. In your September 18 speech, in asking for a greatly extended AEC program, you said "If this doesn't buy us time to make peace, nothing will." Now, the operating theory, as I understand it, by which we relate peace and weapons of war is this: one creates a weapon, holds it out toward a potential adversary and says, "Look, hadn't you better behave?" This is what we actually do with regard to conventional weapons. In the field of atomic energy, however, we erect a screen and say, "There is something horrible behind this screen, so you'd better behave." It may very well be that what is behind the screen is underestimated by our potential adversary. I think it may have been something of that sort that was in your mind three years ago when you said it might be a very good thing to open for discussion the question of revealing the size of our atomic stockpile.[1] Do you have any comments on this subject now?

SENATOR MCMAHON: You mean about revealing the size of the stockpile? You will recollect that in the speech that I made a couple of years ago, I tried to marshal arguments—as they occurred to me then—for giving out the information as well as arguments for concealing it. Frankly, at that time I was not so much interested in revealing or not revealing the general number of bombs as I was in using the situation to illustrate the incompatibility of this whole enterprise with our basic concepts of democracy; I wanted to get more people thinking about that. The latest manifestation of the growing realization that there is such an incompatibility came the other day when a young Congressman introduced an amendment to the McMahon Act providing for a rotation of three of the House members each year on the ground that the Congress did not know anything about what was going on in the atomic energy enterprise. As to the Russians knowing about the force of the bomb—having exploded one themselves, they must be aware of it, through immediate observation. Do you think there is any lack of appreciation today in the mind of anyone in a responsible position in the world of what this thing is?

MR. DAVIES: I can imagine that the Russians may be doing rather poorly with respect to rate of manufacture of atomic bombs. They may take that as their yardstick of the probable performance of the United States, and underestimate our power in this area by a very large factor. This would be, I think, to the disadvantage of our efforts to maintain peace—rather than to win a war—by our atomic armaments.

SENATOR MCMAHON: Well, General MacArthur, in the inquiry last April, said, in answer to my question about the tests in Nevada and what they portended in the way of future developments of atomic weapons, said—believe it or not—that he did not know anything about that, because he was a theater commander and that was information that he did not have.[2] Of course, naturally, my next question was, "In other words, you would take the chance of plunging us into world conflict without knowing anything about one of the basic facts which the Joint Chiefs of Staff have to take into account in evaluating our over-all strategy. Well, I have now contradicted my own statement, and said that there *are* some people in high positions who are not aware of the implications of atomic weapons, but I doubt whether the gentlemen in the Kremlin are in the same category with General MacArthur. Do you have any doubt but what they do have a fair estimate of our stockpile?

MR. DAVIES: I haven't the slightest idea. If they do have, then I think almost the last reason for suppressing information about the size of the stockpile is now gone.

SENATOR MCMAHON: I cannot say categorically whether they do or don't. I am not talking on the basis of intelligence reports. I am talking on the basis of logic and reason.

MR. RABINOWITCH: I think they can make at least as good a guess as any one of us who is here, and I suppose we all can make a pretty good estimate merely on the basis of published information.

SENATOR MCMAHON: Within 15 per cent.

MR. RABINOWITCH: Well, maybe our error will be wider, but that does not matter very much. I often wonder what the Soviet leaders would do if we make public the size of our stockpile and rate of our production and ask them how many they have and how fast they are producing the bombs. If they give a low figure, they will lose strength in the eyes of the world; if they give a high figure, they will give the lie to their own propaganda which for several years has maintained that they are using atomic energy mainly for peaceful purposes. They will be very much in a quandary, and may even, in the end, say the truth.

SENATOR MCMAHON: This is an amusing and interesting idea; it has not occurred to me.

SUPPLIES OF URANIUM

MR. RABINOWITCH: I think maybe we should now venture on thin ice, since all of us have on our minds questions concerning your program of shifting emphasis from conventional to atomic weapons for purposes other than long-range bombing. These questions inevitably come close to what cannot be answered. Shall we ask such questions?

SENATOR MCMAHON: Sure.

MR. RABINOWITCH: You said "the sky's the limit"—when it comes to the number of atomic weapons we can produce. How did you mean it?

SENATOR MCMAHON: Well, it is a figure of speech, but it is obviously within certain wide limits. It depends upon the effort that you want to put into getting more material.

MR. RABINOWITCH: The question I was going to ask was: does this bear relation to newly discovered abundant supplies of raw materials?

SENATOR MCMAHON: Well, of course, I cannot refer to any sources other than those which have been made public. The uranium situation reminds me in some respects of the oil situation. I can remember stories not so many years ago that all the automobiles would have to be retired and

[1] An address given by Senator McMahon in Detroit, January 31, 1949, and published in the *Bulletin*, V (March, 1949), pp. 66–68, under the title "Should We Reveal the Size of Our Atomic Stockpile?"

[2] See extracts from this testimony on page 14 of this issue.

livery stables would have to come back because the oil reserves were only so and so many barrels, and they would be exhausted in such and such a time; instead of that, of course, new reserves have been opened up and more efficient refining methods have made more profitable and efficient use of that which we did have before, and so it is in some respects with uranium.

I am convinced, for instance, that the Colorado plateau has not even begun to be tapped. However, we may have to put the price up. In fact, I know of a mine that was opened in Georgia just a little while ago and the owners of the mine were *afraid* it might be uranium! They were delighted to find it was tungsten. If it had been uranium, it would not have paid them to mine it. With tungsten, it was a highly profitable operation. I think that the end value is so great that we can afford to pay a higher price for uranium, and I think we should be prepared to pay it.

MR. RABINOWITCH: I have always hoped that the Soviet production might be restricted by a lack of high-grade raw materials. Now, if it turns out that large amounts of uranium can be extracted from low-grade materials, this hope will have to be abandoned—because they certainly will pay no attention to costs.

SENATOR MCMAHON: Well, of course, if thorium ever becomes a prime source, I imagine that they have plenty of that. There is plenty of that in this country too.

TACTICAL ATOMIC WEAPONS

MR. RABINOWITCH: With large amounts of atomic explosives at our disposal, is it your idea that for political or military reasons, or both, it would be to our advantage to put most or all of them into relatively small bombs for use under field conditions rather than in "orthodox" atomic weapons? I would say this development—the shift of atomic weapons from mass destruction to limited objectives—is the only one that scientists did not foresee in 1945. Scientists did not anticipate a possibility that atomic weapons would be used mainly for tactical purposes.

SENATOR MCMAHON: I think that the present world situation requires that we have both tactical and strategic atomic weapons. I expect that we would have to use both tactical and strategic atomic weapons in the event of war. I expect that we would have to use both kinds if we actually had to meet active aggression. If Soviet armies were to march into Western Europe, I certainly would expect that we would not only use tactical bombs to stop them, but hit back at them with strategic atomic bombing.

MR. SIMPSON: With the tactical weapons of the kind mentioned in your recent speeches, do you think that the use of weapons of this type could have changed the course of events in Korea, during this past year, or could it change it in this coming year, if the fighting were to continue?

SENATOR MCMAHON: John, I don't want to comment on the bomb's use in Korea.

DESTRUCTIVE POWER OF "BABY BOMBS"

MR. AXEL: When the press talks about "tactical bombs" and "baby bombs," one gets the feeling that they are talking about something of the size of a pistol. I wonder whether you could say something authoritative about the destructive power of a "tactical" atomic weapon, to indicate that it is still orders of magnitude more destructive than any "conventional" non-atomic arms?

SENATOR MCMAHON: They may call them "baby bombs," or "tactical weapons," but if it is an atomic explosion, its destructive power will be so great compared to any conventional kind of weapon as not to admit of a fair comparison.

MR. RABINOWITCH: I think you would agree that the public receives the idea—and descriptions by some science reporters support it—that we can now make atomic bombs that are really "babies" compared to the bombs used in Japan; and if this idea is incorrect, I think it is bad that it gets general credence without those in authority setting the public mind straight

SENATOR MCMAHON: Well, if it is a baby, it is a tough baby.

MR. RABINOWITCH: Perhaps you might answer this question, not really quantitatively, but at least as to the order of magnitude. If we concentrate on making this kind of tactical or baby bomb instead of the big brothers, would this change the "order of magnitude"—would this add one or several zeros to the figure representing the number of atomic weapons that one can make, given a certain rate of production of fissionable materials. I have the impression that the public is led to believe that one can take the big bomb apart and make it into dozens or hundreds of small bombs; this is the way reporters put it.

SENATOR MCMAHON: Well, I don't know whether I can say something about this; certainly not quantitatively. All I can say is—well I just don't think I can get into that. I'd better not say anything.

MR. RABINOWITCH: I was just wondering whether it was good for public opinion to go too far astray in this matter.

SENATOR MCMAHON: You scientists always said that you needed a critical mass to make a bomb—but we never have revealed what a critical mass is.

MR. RABINOWITCH: The question is: *how* different a "tactical" critical mass can be from a "strategic" critical mass.

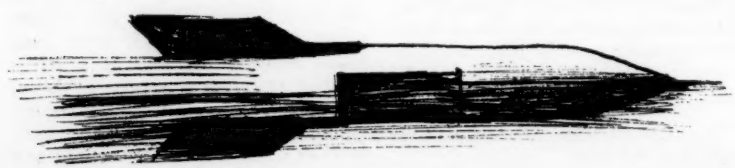
SENATOR MCMAHON: What is next?

TARGETS FOR TACTICAL ATOMIC BOMBS

MR. RABINOWITCH: Logically the next question is that the public is led to believe now that tactical atomic bombs could be used in approximately the same way as ordinary artillery has been used in the last two wars—to lay a barrage of hundreds or even thousands of shells. Is it not correct that even tactical atomic bombs still remain, in your new concept of atomic strategy, weapons for certain special tactical situations, such as crossing of a river, or landing on an enemy shore?

SENATOR MCMAHON: I think that if you had them in sufficient quantity, you could use them on anything you wanted to hit, whether troops in the field, or river crossings, or strategic targets.

MR. RABINOWITCH: Would you excuse us for pressing questions? Do you contemplate ever having them in such



quantities that you would not have to restrict their use to certain critical tactical situations, where they can give special advantage?

SENATOR MCMAHON: I think that if we go into the kind of expansion program that I have been advocating, the scope and the opportunity for the use of atomic weapons will be much wider, so much less limited, than now. If you asked me, dc I think that we could make the supply so abundant that it would give us freedom in the choice of targets, my answer is "yes."

MR. AXEL: When you have something like a tactical atomic weapon, would it not still be able to destroy, say, a whole group of tanks? So that, if you use such a tactical atomic bomb on one tank, it will certainly do the job, but will waste much of its destructive power? Now it may be that we will have so many bombs that we can afford to waste their power; but would we have bombs whose size will be so small that one tank is all that they are going to hit?

SENATOR MCMAHON: Obviously, you're not going to shoot a cannon to blow out a candle. To destroy one tank I don't suppose that you would ever feel that you could afford to use, nor would it be necessary to use, an atomic bomb. However, the very threat of atomic weapons in plentiful supply would keep those tanks so separated that they could be handled with conventional weapons. This means to me that you would disperse your opponent's fire-power, and the minute you disperse the opposing fire-power, you are able to handle the situation with much, much fewer men.

MR. RABINOWITCH: It has often been said that possession of strategic atomic bombs—given equal number of bombs and equal capacity to deliver them—will benefit us less than the Soviet Union, for several reasons, such as the much greater local concentration of industry and population in America. Do you think that tactical atomic weapons, if they could be used by both sides, would bring us relatively more advantages?

Is it not, unfortunately, true that we will be more inhibited by them, first of all, because we are so dependent on landing operations of the type of the Normandy landing or the landings on Pacific Islands, and atomic bombs are ideal weapons to make such landings impossible? In the Korean war, for example, did not the one situation where the use of an atomic bomb could have been decisive occur when we were hemmed in in the Pusan perimeter? If the Russians had decided at that time to give one or a couple of bombs to the North Koreans, our whole position there could have been made untenable.

SENATOR MCMAHON: If they had given them an atomic bomb and they had dropped it in the middle of us down there, that would have been a horrible situation. Well, Doctor, your worries pose the question of air superiority, of keeping the enemy out of the air above the ports or landing beaches, keeping them covered the way the British covered the Dunkirk evacuation. They were able to take all those troops from the beaches at Dunkirk and get them over to England by keeping control of the air. In a limited space, I would presume that would be what we would have to do. Of course, I imagine it would be awfully hard to keep a single fellow from sneaking through with one bomb.

Doctor, I would be the last one in the world to say that the invention of atomic weapons had eased our military problems. As you know, it has magnified them.

CIVIL DEFENSE: THE PROBLEM OF DISPERSAL

MR. RABINOWITCH: Speaking of magnified defense questions, would you care to say something about the civil defense situation—particularly over the dispersal program. You may have seen that the *Bulletin* has recently published a special issue on Dispersal, but we did not notice much response to it.

SENATOR MCMAHON: The most regrettable thing to me was the defeat in Congress of the dispersal plan for Washington, D.C. A very potent opposition to a large campaign of dispersal in the United States is due to its regional implications: this theory, for example, of moving New England industry—and I don't say this simply because I represent Connecticut—out to Nevada! I will agree with Taft that there *are* limitations to what we can do; I don't subscribe to his views as to *where* these limitations are. I would certainly put within these limitations the dispersing of our command headquarters. To me, not to do so would be a very foolhardy thing indeed.

You will remember the appropriation request for this purpose was 125 million dollars, and we lost it. Frankly, if the enemy were to strike Washington and hit it right, it would seem to me that this would make it very difficult for us to operate. It is difficult to run a war without a command headquarters.

Now, getting to civilian defense, more generally, around the country, this has to be organized, as you know, on the municipality or state level. The Congress has refused to give Caldwell the money that, in my opinion, he absolutely should have had as federal contribution. We just cannot believe, as a people, that it can happen here, and I think that is the basis of the present situation; you just cannot convince people such as ours that the danger is real. They may say, "Yes, yes" intellectually, but emotionally, they feel—oh, you know—we should not be getting too excited over it.

MR. RABINOWITCH: The lack of response to the issue of the *Bulletin* devoted to dispersal really shocked me. We had considerable response to our first civil defense issue which dealt with the more trivial aspects of civil defense—rescue and assistance *after* an attack. We are asking ourselves what more could we do about it. I wonder whether you personally or the Joint Committee could not go more strongly and more repeatedly on record emphasizing the urgency of a dispersal program.

SENATOR MCMAHON: Doctor, they say politics is the art of the possible, you know. What better demonstration of the necessity for going ahead with civil defense could you have than the announcement that the Russians have exploded three atomic bombs? But, despite all that, there is no willingness to act logically. I just don't think we're going to do it.

MR. RABINOWITCH: The President's recent order about location of government-subsidized new industrial construction is the first step in the correct direction.[3] I think we have to get after American business and industry—impress them with the danger of losing their whole investment if they do not go along with a sound dispersal program.

SENATOR MCMAHON: Well, I don't

[3] See *Bulletin's* issue on Dispersal, VII (September, 1951), p. 263.

know. I don't see them rising up, when Congress defeated that dispersal plan of Washington—which may be the key operation in the whole program. If the capital could be wiped out, the industrial cities might be wiped out, too. Yet, I didn't hear any protest from them.

MR. RABINOWITCH: There may be some special elements involved in this particular situation. The business men may say: look at all these Democrats (or, more generally, all these politicians); they want, first of all, to get themselves out of danger.

THE JOINT COMMITTEE AND CIVIL DEFENSE

MR. SIMPSON: I think there is a question of whether the Joint Committee has any responsibility for pointing out to the country at large, and to this new Civilian Defense Agency, what are the most important things that must be done.

SENATOR MCMAHON: They made some wonderful studies and published them themselves. We don't have jurisdiction in civilian defense. The story, very briefly, is that, after the first Soviet atomic explosion in 1949, I announced that I would hold hearings, I think in December or November of 1949, and they were postponed until January 1950. I held some hearings. They were not too well advertised, but they got some publicity, and we opened up the subject. The government was about to introduce legislation, and the executive department had a bill drawn which they wanted to submit. The question was whether we would handle it, or whether the armed services would handle it. Armed Services Committee at that time had Senator Tydings as chairman. We argued it back and forth as to who should have jurisdiction in this field; but I must confess that under the Reorganization Act, Armed Services had a much sounder claim to it than our committee had, and we had to recognize this.

PUBLIC APATHY TO CIVIL DEFENSE

MR. AXEL: Do you think that the AEC and therefore, your committee, could help civil defense by staging a bomb test which would be much more public than those held so far? A test in which the American public could see familiar streets, buildings, etc., before and after an atomic bomb explosion? From such a test the American people might get a much better realization of the danger than they have from pictures of unknown cities in rubble.

SENATOR MCMAHON: I suppose that would be a very illuminating example, but can you suggest a city that you want to blow apart?

MR. AXEL: I was not thinking of a whole city, for there would only have to be a few typical buildings.

SENATOR MCMAHON: Well, how about Hiroshima and Nagasaki? There have been pictures of these cities all over the country.

MR. AXEL: The whole type of architecture was so different from ours here that the usual thing you heard was that "those are wooden buildings that all went up in fire. This would not happen here." Could we publicize the effect of the bomb on something a little more typically American?

SENATOR MCMAHON: We *have* made such tests. I have seen the moving pictures. I think—and I have been suggesting and urging this—that they should declassify more of these Eniwetok records. Having seen the moving pictures of them, I think they would be a very impressive exhibit to the American people. They had erected all kinds of structures over there. It is an amazing thing to look at these pictures and see the shock-wave coming. You see much more in this way, I am sure, than you would have seen if you went to Eniwetok yourself.

MR. AMRINE: It has been suggested that we set up in the open prairie an American frame house, brick houses, sample factories, etc., and dramatize the effect of an atomic bomb by having the test covered, as at Bikini, by the press of the world. You could have civil defense corps as observers there. It seems to me that the problem is one of bringing it home in an emotional way to the average citizen.

MRS. ALAN SIMPSON: The British live among their ruins, and yet they don't think about it any more than we do. They have the same headaches with setting up civil defense. It's so horrible that people just say, "We're doomed, anyhow," and go on living.

SENATOR MCMAHON: That, of course, is a bad attitude and it isn't good for defense.

MR. RABINOWITCH: That is why dispersal must be put up to industry and business as a proposition for hard-headed decision, as a rational way to secure their future, and not made dependent on the emotional attitude of the average citizen.

SENATOR MCMAHON: Now, wait a minute, what are you going to do to my state of Connecticut? Let me be provincial about it. Let me act like a Congressman from back home. For instance, we of New England want to build a steel mill. Unless New England has competitive steel, its metal industry is going to go the way of textiles. We cannot compete without competitive steel, which now becomes possible owing to the discovery of Labrador iron ore.

The automobile industry does not necessarily all belong in Detroit. It started in New England, you know. Stevens, Duryea, Locomobile, Rolls Royce up in Springfield, the Stanley Steamer, half a dozen of the old names that are forgotten now, died because they could not obtain steel cheaply. Now are you going to say to the industry of New London, Connecticut, New England generally, that they cannot have a steel mill somewhere in the New London area?

PUBLIC MISUNDERSTANDING OF DISPERSAL

MR. RABINOWITCH: I think it is one of the tragic things about the dispersal business that it got mixed up with the ideas of people who want to use the atomic bomb threat as a lever to industrialize backward states, to move the industry South or West. These two things have to be strictly separated.

SENATOR MCMAHON: Las Vegas has a monopoly on legal gambling; they shouldn't want all the steel, too.

MR. RABINOWITCH: Defense dispersal and regional relocation of industries should be clearly separated. The present plan is merely to avoid the persistence or growth of hard cores of population and industry, and, instead, to place the industrial communities ten or fifteen miles out of the population centers.

SENATOR MCMAHON: What I am trying to show you, however, is that there is a practical problem here. We have got to operate with the existing political system. There is nobody more keenly alive to the dangers of atomic bombardment than I am, and yet you will not hear me advocating the decentralization of industry out of Connecticut. The first job of a fellow in Congress, you know, is to stay there; once out of it, he is no good.

MR. RABINOWITCH: But would you

be able to advocate the decentralization of industry within Connecticut?

MR. SIMPSON: I think there has been considerable misunderstanding about decentralization. After all, an atomic bomb has only a certain range. It is just a question of getting to a point where you minimize the chance of losing too much in one blow.

MR. DAVIES: It means the move to Nevada in most people's minds.

SENATOR MCMAHON: Let me tell you about the background of the situation—of which you probably are not aware. In 1944, in October, Senator McCarran had a committee composed mostly of fellows from the mountain areas, and they made what was known as the McCarran report. I remember it very vividly because I was running for the Senate in Connecticut, you see, and although all the Democrats from that area joined the Republicans in opposition, nevertheless, the plan was denounced as a Democratic New Dealing proposal, and I had a hell of a time in October of 1944 campaigning against the McCarran report—which was going to move all industry out into the wide open spaces. The atomic bomb was not even in existence then. So when you talk in New England about dispersal or decentralization, you are thought to be talking, not on atomic hazards as such, but using the atomic threat to implement the McCarran report of 1944.

MR. RABINOWITCH: Isn't the best way then for the Senators and Congressmen from New England to present a program originating in this area, to set their own house in order, stimulating the dispersal within their own territory—the way it was done in Seattle after the Defense Department ordered the big airplane factory to be moved from there to Texas?

SENATOR MCMAHON: I have an appointment at one o'clock so if you have any more questions you would like to ask, go ahead.

WOULD EXPANSION OF ATOMIC WEAPONS PROGRAM REDUCE MOBILIZATION COSTS?

MR. RABINOWITCH: Just one last question: You said that the Chiefs of Staff and the civilian secretaries are in agreement with the necessity of the large expansion of atomic weapons production which you have proposed. Does it imply that they agree that this would result in the reduction of the over-all costs of the mobilization program?

SENATOR MCMAHON: No, I cannot say that they are in agreement on that. I do not question them particularly on that. I view the program as economical in this way. The greatest economy, of course, would be the prevention of an armed conflict.

Number two, in the horrible event that we have such a conflict, we would stand a better chance of winning it and win it more quickly; this would be the second greatest economy, infinitesimal though it may be compared with the first one. The third one is the economy of dollars spent on the armed forces, plus the contribution that reduction in the expense would have on slowing down the approach to what might be termed the "showdown position." That I would find agreement in the armed forces on the contention that my program would save dollars, I did not expect, because I think that our military, like all military from time immemorial in all countries, would like to have everything—what they have already had, and this new theory on top of that, too.

Now, what I want them to do, if you can compare it to a cake, is I want them to start putting in layers instead of using it just as icing on top. It is going to be a struggle, but I think it can be done. I'd like to ask you, what is your opinion about it?

MR. RABINOWITCH: I am afraid I am somewhat skeptical.

SENATOR MCMAHON: Are you skeptical because you don't think it is possible, or are you skeptical because you believe that the military bureaucracy is such that you cannot move it?

MR. RABINOWITCH: You don't have to convince scientists that atomic energy and atomic bombs are something quite different from what has been before. Yet it seems to me that similar examples can be found in the past. Take the air force, for example. Did it not look as though if one developed it, one would need, instead of big military establishments, merely hundreds of planes and a few thousands of people to fly and service them. And yet, it turned out that if you wanted to have a really large air force, you had to put, as we do now, not only much more money, but even more men, into it than you ever did in the foot army.

SENATOR MCMAHON: The question, is, were you to put that effort on the proper kind of planes, meaning atomic ones, whether you would have to have a foot army of the size that we had in World War II. We had about twelve million men in the ranks in 1945. I do not think anybody is contemplating any such land force today.

MR. RABINOWITCH: I just mean that I would like to see some sort of estimate on the cost of your atomic army and air force before I believe that it will make our rearmament cheaper.

MR. SIMPSON: Well, I think that you certainly have to take an experimental point of view on this thing. The important thing is to get the program going and keep surveying it, and, if it doesn't come up to your expectations, there are always people who will help you cut it back. But the point is to get the thing rolling and find out what it can do; and, if it can do everything you want and more, well, you've saved yourself a considerable amount of time and money.

SENATOR MCMAHON: Speaking about submarines, certainly, you could make an argument of "what do you want submarines for anyway" and "who has the Navy which the submarines will have to fight"; but let's forget that for a moment—it won't hold water. Certainly, a smaller number of atomic submarines would be necessary. I think we can easily see that. If you are going to have 150 of the ordinary kind and 25 or 30 of the other kind, you ought to be able to do the same job.

MR. AXEL: I am convinced that you could have economy if there was a force of known size that you intend to fight. Is our intelligence sufficiently good so that we can say, "This is what we need because of what they have," or do we say, "This ship may be a useful addition and we better have it, too?"

SENATOR MCMAHON: Well, I think in certain respects our intelligence is good.

ATOMIC ENERGY ACT: SECOND STAGE

BYRON S. MILLER

The author of this commentary on the first major amendment to the Atomic Energy Act of 1946 was formerly counsel to the Joint Committee on Atomic Energy, and is credited with being one of the leading architects of the original act. Presumably this amendment was needed to pave the way for new agreements reached by Mr. Churchill and Mr. Truman this month.

CONGRESS has adopted the first major amendment to the Atomic Energy Act of 1946. The amendment became law with the President's signature on October 30, 1951.

It is a matter of some moment that the sole effect of the amendment is to lessen secrecy restrictions, and that it was approved unanimously by the Congressional Joint Committee on Atomic Energy and both houses of Congress. The new law permits the release of large areas of restricted information to other countries pursuant to carefully detailed procedures.

The rest of the story is less sanguine and less certain. The Senate Committee report states: "This problem in all its ramifications involves considerations of secrecy and cannot be detailed here." Debate on the floors of both House and Senate adhered closely to the language of the report that restricted information can be released to other countries in exchange for "tangible benefits" from these other countries, and that failure to do so "would mean that the United States will be less well equipped—in measurable degree—to use atomic energy for defense purposes." Senator McMahon quoted the Chief of Staff, General Omar Bradley, as being "very vigorously in favor of the amendment." Senator Hickenlooper and Representative Elston felt obliged to state that they would not support the amendment if it "met with opposition from the military." Both spoke in its favor.

Offered this lean fare, the press was not loath to speculate as to the meat of the amendment. Most energetic was the *Washington Star* which found six "tangible benefits" possibly involved for the United States, ranging from supplies of uranium, thorium, and heavy water from Belgium, India, Norway, and the Netherlands, to more advanced technical information on reactor operation from Britain, Canada, France, and (*sic*) Argentina. Frequent newspaper reference to advanced reactor design in Britain and Canada was itself an ominous commentary on the consequences on our own research program of the information restrictions in effect in this country.

But whatever the reason for this secretly motivated reduction of secrecy, its unanimous adoption comes in startling contrast to the heated opposition with which efforts to expand the exchange of information with our wartime partners, Britain and Canada, were repulsed in 1949. Perhaps the difference in response indicates that Congress has finally absorbed the fact of Russian atomic bomb production; perhaps the present Commission has demonstrated diplo-

EXCERPTS FROM MacARTHUR HEARINGS

MAY 4, 1951

As brought out by Senator McMahon, in the interview on preceding pages, it was discovered in the hearings concerning General MacArthur's dismissal that the Supreme Commander of the UN forces had never really been "briefed" on the details of U.S. atomic strength. *(See p. 9).*

As can be seen in the following excerpts from the General's testimony, apparently he regarded specific current information on the atomic stockpile, tactical bombs, etc., as "beyond my own authority."

Elsewhere the General had previously revealed that at the time of the Hiroshima-Nagasaki bombs which ended the war, he was likewise only sketchily informed on the potentialities of atomic weapons.

Perhaps the U.S. is approaching the day when not even top military commanders will be permitted to know top military secrets. At that time the Federation of American Scientists will no doubt welcome all Ex-Generals who protest against excessive civilian secrecy!

SENATOR McMAHON: General, are you aware of what our atomic preparedness situation is today?

GENERAL MacARTHUR: Only in a very general way, sir.

SENATOR McMAHON: I am not asking you for numbers, but do you know the numbers in our stockpile?

GENERAL MacARTHUR: I do not. I have no more information on that than the average officer would have. It's confined to a very select circle, you know. . . . I have never attempted to pry into matters which I regarded as beyond my own authority.

SENATOR McMAHON: Have you at

(Continued on next page)

macy of a new order. More likely, a convincing case was made that something was badly needed by the U.S. which would only be forthcoming in exchange for our know-how in this high-cost field of scientific endeavor. If the stake was some other country's know-how, then the amendment could better have lowered secrecy barriers within the United States in order to improve our own research, as many atomic scientists have urged from the beginning.

Turning to the provisions of the amendment, we may summarize them as follows:

1. *Scope of information covered.*—The amendment refers to "restricted data on refining, purification and subsequent refinement of source materials; reactor development; production of fissionable materials; and research and development related to the foregoing." Expressly excluded are "restricted data on design and fabrication of atomic weapons." Also apparently excluded, since they are not expressly included in the amendment and are within the original prohibitions of the Act, are data on the number, military effectiveness, and rate of production of atomic bombs. To scientists, however, the scope of the amendment would seem to cover all of the areas for which they have heretofore sought fewer secrecy restrictions.

2. *Procedure.*—Such information can only be transmitted to friendly nations with adequate security standards under circumstances that "substantially promote . . . the common defense and security of the U.S." Action can only be initiated by unanimous vote of the AEC (compare the 4:1 vote on distribution of isotopes which furnished considerable ammunition for the Hickenlooper attack on Lilienthal); then comes a written recommendation from the National Security Council to the President (favorable or unfavorable); next, a written determination by the President; and, finally, notification of the Congressional Committee and a thirty-day wait while Congress is in session to give the Committee an opportunity to have "a great coercive effect on" the AEC, to quote Senator Hickenlooper. This latter provision is the latest of many recent examples of direct legislative participation in the performance of duties assigned to the executive branch of government under the separation of powers which is a basic part of the United States Constitution. However, it has a specific precedent in Section 7 of the Atomic Energy Act, which provides a similar waiting period before the AEC may exercise regulatory powers over nonmilitary uses of atomic energy.

3. *Companion amendment.*—In addition to expanding the AEC's power to release restricted information, the new law also relaxes the restriction against private participation in the production of fissionable material outside of the United States. It permits private participation in this specific type of program. The addition of this provision may indicate that a specific use of the new law was contemplated by the Congress, and that this use involves direct assistance in the operation of some foreign reactors.

This discussion would not be complete without consideration of the relation of the amendment to the working agreement between the U.S., Britain, and Canada beginning early in World War II. The Committee report expressly states:

"The committee of course intends that the Section 10 amendment have no retroactive but only prospective application. The meaning of the remainder of Section 10 would remain completely unchanged. In particular, the existing technical cooperation arrangement of the United States with Britain and Canada, which has its roots in the wartime partnership between the three countries, remains unaffected."

Beginning in 1942 and again in 1943, the United States entered into binding agreements with Britain and Canada involving the unrestricted exchange of information on atomic energy. No mention of these arrangements was made in the Atomic Energy Act of 1946, and there is some basis for concluding that they were never explored by the Senate committee which drafted the Act. Later, in 1948, a revised agreement, the so-called "modus vivendi" was worked out, which reportedly excludes military and production information from the area of exchange.

Independent of the new amendment, the President's constitutional

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(*Continued from page 14*)

any time advocated the use of the atomic bomb in your theater? . . . Did you recommend its use?

GENERAL MACARTHUR: I did not. As I understand it, the use of the atomic bomb has, by fiat and order, been limited to the decision of the President of the United States.

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SENATOR MCMAHON: Ceneral, are you familiar with the fact that we held some tests out in Nevada a few months ago which were known as the Nevada tests?

GENERAL MACARTHUR: I am aware of that.

SENATOR MCMAHON: Are you familiar with the results of those tests?

GENERAL MACARTHUR: Only in a very general way.

[Deleted.]

★ ★ ★

SENATOR MCMAHON: Do you think or have you any intelligence, any access to intelligence reports about Russian potentialities in the building of atomic weapons?

GENERAL MACARTHUR: Very little.

SENATOR MCMAHON: Does that give you an estimate as to how many they possess today?

GENERAL MACARTHUR: No, sir.

SENATOR MCMAHON: Have you sought to get that information?

GENERAL MACARTHUR: Not at all.

SENATOR MCMAHON: If, by following your recommendations, a conflict is precipitated with Soviet Russia, be it in the European theater or the United States itself, or in the Far East, you have made no study as to the kind of damage that they could do to our forces in Korea and our general situation in the Far East with their atomic weapons; is that correct?

GENERAL MACARTHUR: I don't believe for a minute from my general knowledge of the situation that the enemy has the potential or the inclination to use his limited atomic weapons in such an area as Korea or China.

power as sole organ of the government in the field of international relations is probably sufficient to support an Executive Agreement on exchanges with Britain and Canada regardless of the Atomic Energy Act. Indeed, the adoption of the 1943 agreement was also supported by the President's constitutional and delegated war powers so as to authorize agreements extending beyond the war period, if necessary to achieve something needed during the war. Thus, the amendment seems legally unrelated to arrangements between the wartime partners which have not and probably will not run the gauntlet of the amendment's intricate procedures. However, its unanimous adoption has the practical effect of giving Congressional and military endorsement to the idea of international exchange of atomic knowledge. In passing, it might be added that in view of the President's foreign relations powers, perhaps the only legal effect of the amendment is to authorize private persons to participate in reactor operation abroad.

Senator McMahon, speaking on the floor of the Senate after unanimous approval of the amendment, commented:

". . . this is the first major amendment to the act which Congress passed in 1946 to operate the atomic energy project. I think that is a pretty good record. . . . I now wish to pay my tribute to the Senators and the members of the House of Representatives who in 1946 were able to fashion a piece of legislation which had been designed to carry out behind high walls of secrecy the most momentous manufacturing project in the history of mankind, and so fashioned it in a totally unexplored field that now five years have gone by before the necessity for a major amendment has arisen."[1]

[1] Miller, "A Law Is Passed—The Atomic Energy Act of 1946," *University of Chicago Law Review*, XV (1948), 799, 820–21.

Editor's Note—

At right is printed the complete text of the Bill which subsequently was passed, amending the Atomic Energy Act.

A BILL

To amend the Atomic Energy Act of 1946, as amended.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 5 (a) (3) of the Atomic Energy Act of 1946, as amended, is amended to read as follows:

"(3) PROHIBITION.—It shall be unlawful for any person to (A) possess or transfer any fissionable material, except as authorized by the Commission; or (B) export from or import into the United States any fissionable material; or (C) directly or indirectly engage in the production of any fissionable material outside of the United States, except, subject to the limitations and conditions contained in section 10 (a) (3), as authorized by the Commission upon a determination by the President that the common defense and security will not be adversely affected thereby."

Section 10 (a) is hereby amended by inserting the following subsection 10 (a) (3) after subsection 10 (a) (2):

"(3) Nothing contained in this section shall prohibit the Commission, when in its unanimous judgment the common defense and security would be substantially promoted and would not be endangered, subject to the limitations hereinafter set out, from entering into specific arrangements involving the communication to another nation of restricted data on refining, purification, and subsequent treatment of source materials; reactor development; production of fissionable materials; and research and development relating to the foregoing: *Provided,*

"1) that no such arrangement shall involve the communication of restricted data on design and fabrication of atomic weapons;

"(2) that no such arrangement shall be entered into with any nation threatening the security of the United States;

"(3) that the restricted data involved shall be limited and circumscribed to the maximum degree consistent with the common defense and security objective in view, and that in the judgment of the Commission the recipient nation's security standards applicable to such data are adequate;

"(4) that the President, after securing the written recommendation of the National Security Council, has determined in writing (incorporating the National Security Council recommendation) that the arrangement would substantially promote and would not endanger the common defense and security of the United States, giving specific consideration to the security sensitivity of the restricted data involved and the adequacy and sufficiency of the security safeguards undertaken to be maintained by the recipient nation; and

"(5) that before the arrangement is consummated by the Commission the Joint Committee on Atomic Energy has been fully informed for a period of thirty days in which the Congress was in session (in computing such thirty days, there shall be excluded the days on which either House is not in session because of an adjournment of more than three days)."

DOMESTIC CONTROL OF ATOMIC ENERGY

ROBERT A. DAHL and RALPH S. BROWN, JR.

Through the courtesy of the authors and others with the Social Science Research Council, the Bulletin is able to bring its readers a comprehensive digest of a significant publication, Domestic Control of Atomic Energy. *This book, reflecting years of study of this and similar problems, by Robert A. Dahl, of Yale University, and Ralph S. Brown, of Yale University Law School, as well as some years' concern with atomic energy by the Social Science Resarch Council, will be of utmost interest to students of Atomic Energy Commission policy. The authors themselves prepared a 10,000-word digest which is about half as long as the original book. It is hoped that publication of this summary, of which we print here the first installment, will bring to the Bulletin some letters and comment giving further discussion of the controversial questions raised here.*

This report undertakes to answer three questions:

1. What aspects of domestic control over United States atomic energy operations are susceptible to research by social scientists?

2. What research on this subject has been completed or is under way?

3. What research in this general area might—or might not—be profitably undertaken in the near future?

A number of social scientists have already begun work on some of the problems of atomic energy operations. It is our impression, however, that others still unfamiliar with these operations have shied away from research in this area because of two assumptions: (1) that anyone who is not an engineer or a physical scientist must inevitably find himself incompetent to deal with relevant research problems because of the esoteric technical characteristics of atomic energy; (2) that what a social scientist might like to know would necessarily be concealed for reasons of security.

To be sure, on some kinds of problems one or both assumptions appear to be correct, but there are also many problems with which social scientists are competent to deal and about which there is a substantial amount of available information.

Three major gaps in this report are deliberate. First, it is limited to problems of domestic control and does not touch upon questions of international control and foreign policy.[1]

Second, this report does not consider military applications of atomic energy or the related problem of civilian defense.

[1] This does not mean that problems of international control have been adequately treated in published works. Only two relevant studies are known to be under way. George Carroll of the Case Institute of Technology is preparing a comprehensive study entitled "The Formation of American Policy Concerning Atomic Energy." Robert W. Frase with the aid of a Guggenheim fellowship has completed a first draft of a manuscript on the international control of atomic energy and other armaments.

Authors' Note—

While the document here summarized was prepared for the Social Science Research Council, the Council has not reviewed the document in terms of its explicit or implicit statements regarding policy questions, and hence the views expressed are solely those of the authors. In the course of the condensation many source references and the bibliographical material have been omitted.

Third, problems of secrecy have not been placed in a separate category. They are ubiquitous. Secrecy either changes the dimensions of a problem from what one would expect (e.g., the role of the Joint Committee), or it handicaps research on a definable problem, or it does both. We have tried to make these effects and impediments apparent throughout the report.[2] Finally, it should be kept in mind that this report is intended as a reconnaissance and not as a full-scale attack on the problems discussed. We trust that no hypothesis will be mistaken for an assertion about a confirmed observation of fact.

PROBLEMS OF PUBLIC CONTROL

One of the many paradoxes concerning atomic energy is that public policy of extraordinary importance frequently seems to be decided in a political void created by public apathy. For example, if all the people who exercised significant influence on the decision whether to build the hydrogen bomb were brought together, they would probably not unduly crowd the Commission's conference room. Does public apathy about such issues really exist? If it does, why? Here we can do no more than state some hypotheses.

1. Public apathy may not exist. No one has sifted the evidence; criteria of "apathy" are elusive at best.

2. Apathy concerning atomic energy policy may be actually no greater, on the part of the ordinary citizen, than apathy concerning many other issues, such as foreign policy.

3. What is taken to be "apathy" may be rather a reflection of the discrepancy between the interest and expectations of those especially concerned, and the interest of other citizens. The most articulate private spokesman on atomic energy policy have been nuclear physicists. Most of them have had their first real contact with politics through their concern with atomic energy developments. Emotionally involved in a public policy issue as they have never before, they discover an "apathetic" public. But is this "apathetic" public any dif-

[2] Walter Gellhorn's *Security, Loyalty, and Science* (Ithaca: Cornell University Press, 1950) includes in its acute criticism of current policies an examination of AEC classification procedures. This work is highly informative on AEC doctrine and practice concerning every aspect of the scientist's involvement with security or loyalty tests. It refers to little-known AEC documents and draws on many interviews.

ferent from that which other agitational groups have almost always encountered in their first contact with political reality?

4. Herbert Marks has said, "Secrecy is certainly the most important factor in accounting public inertia in relation to the administration of the Atomic Energy Act."[3]

5. Marks has also suggested that the great technical complexity and unfamiliarity of the subject matter bewilders the citizen who might otherwise evince an interest.

6. Marks suggests, too, that supporters of the McMahon Act – who normally might have constituted the relevant critical leadership – become consciously or unconsciously "committed" to defend the administration of the Act. To criticize the Atomic Energy Commission, they might feel, would be to play into the hands of those who oppose the very principles of the Act.

7. Apathy may result from the fact that few important interest-groups are immediately affected by the administration of the Atomic Energy Act. In most AEC decisions, few people stand to gain much or lose much immediately. There has been a ready mobilization of political action when the "interests" of some group have been directly touched by an atomic energy decision.

Such a case occurred in 1949, when the Commission decided to substitute gas for coal as fuel for the Oak Ridge power plant serving K-25 (the gaseous diffusion plant for extracting uranium 235, operated by the Carbide and Carbon Chemicals Corporation). Here was a clear threat to a promising market for coal. As a result the decision of the Commission provoked a considerable amount of rather characteristic opposition. Coal companies appeared before the Federal Power Commission to oppose extension of the necessary gas line; when FPC decided in favor of the Commission, the National Coal Association, the United Mine Workers, and the Railway Executives Association all asked for a rehearing on the FPC decision; a number of representatives from nearby coal-producing states opposed the decision; the Joint Committee conducted an investigation and recommended that gas not be brought in.

8. More than with any other public policy, there is a wide-spread conception of an overriding "national interest" in the production of fissionable materials, compared with which the usual private preferences must give way. The issues, then, tend to be considered technical rather than political; and political activity is sterilized at the outset. The Commission itself fosters this tendency by a vigorous insistence on depoliticizing its operations, by insistence on the overriding importance of technical criteria, and by an articulate policy of refusing to let "political" influences, including patronage, interfere with its technical decisions.

9. Apathy may result because not many organizations are qualified to cope with atomic energy policy. Indirect confirmation of this hypothesis might be found through study of organizations that have influenced policy. It seems likely, for example, that the Federation of Atomic Scientists has been an unusually influential pressure group.[4] On the whole, however, the Atomic Energy Commission lacks organized "constituencies" of the type common in many governmental departments.

10. The contractor arrangements may help create apathy by insulating the atomic energy operations somewhat from political control.

11. Deep anxieties about the consequences of atomic warfare may pervade not only the ordinary public but the potential critical leadership groups as well. Apathy may be only a superficial protective device concealing an interest that cannot be explored without creating profound anxiety.[5]

Four propositions about public apathy appear to rest on considerable evidence. First, "public control" is to some extent an illusion; policy makers operate uninfluenced by many of the pressures usually required for effective control by the public. Second, there is no significant critical group of skilled observers and nonofficial leaders operating between policy makers on one side and the ordinary citizen on the other. Third, although there appears to be a considerable amount of internal criticism of a detailed and informative kind from the Military Liaison Committee, the Department of Defense, the General Advisory Committee, and the like, these critics are official and operate under the mantle of security. Fourth, and consequently, such public opinion, pressure, and intervention as might be brought to bear on policy might prove to be highly irrational, based on ignorance, misinformation, and lack of clarity as to the alternatives.

One task, then, is to investigate this phenomenon. There have been some studies of public opinion and the atomic bomb, particularly those reported in summary by Leonard S. Cottrell, Jr. and Sylvia Eberhart in *American Opinion on World Affairs in the Atomic Age*,[6] and in detail in *Public Reaction to the Atomic Bomb and World Affairs*.[7] There have also been studies of political apathy.[8] But to our knowledge there has been no effort to study the role of apathy in the American reaction to atomic energy policy, despite a feeling among many observers that apathy is more noticeable on this question than on any other of comparable importance.

ROLE OF THE JOINT COMMITTEE

The role of the Joint Committee on Atomic Energy is one of the most puzzling encountered in preparing this report. Persons who have been in a position to observe the relationship between the Committee and the Commission have given entirely conflicting judgments as to the role of the Committee. Some have said flatly that the Joint Committee is little more than a "captive" of the Commission. Others have said that the Joint Committee is extraordinarily influential.

Like its predecessor, the special Senate Committee that in 1946 drafted the Atomic Energy Act, the Joint Committee has acquired a relatively high degree of expertness. Every important policy decision is reported by the Commission to the Joint Com-

[3] "The Atomic Energy Act: Public Administration without Public Debate," *University of Chicago Law Review*, 15:839, 848 (1948).

[4] A doctoral dissertation on the role of the Federation of Atomic Scientists in lobbying for civilian control is now in preparation at the University of California, by Clifford Ketzel, under the supervision of Peter Odegard.

[5] See the pertinent comments on discussions of the atomic bomb in John Dollard and Neal E. Miller, *Personality and Psychotherapy* (New York: McGraw-Hill Book Co., 1950), p. 200.

[6] Princeton: Princeton University Press, 1948.

[7] A report sponsored by the Social Science Research Council's former Committee on Social Aspects of Atomic Energy, published by Cornell University, April 1947, (lithoprinted).

[8] See David Riesman's *The Lonely Crowd: A Study of the Changing American Character* (New Haven: Yale University Press, 1950), which draws on his inquiries into political apathy for their bearing on the characterological scheme presented. That scheme, conversely, offers an explanation of some forms of apathy.

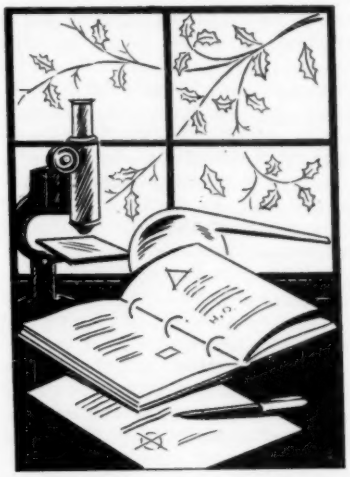
mittee. In most cases decisions are reported *after* they have been taken, not before; the aim is to keep the Joint Committee informed (as the Act prescribes) rather than to obtain its consent for a proposed action. But it also appears that many important policy questions are carefully explored with the Joint Committee *before* a decision is made, and in some cases the initiative may come from the Joint Committee. The Commission evidently has even been willing to transmit information on the actual numbers of atomic weapons in the stockpile, and has been rebuffed by the Joint Committee. One episode, the so-called Hanford overrun, illustrates the relationships between the Commission and the Joint Committee.

To summarize a *cause célèbre* in a few words, the General Electric Company, the over-all contractor at Hanford, estimated late in 1947 that it could build certain new facilities at Hanford for about 6.2 million dollars, and was authorized to proceed. Over the next two years its estimates fluctuated upward to almost 12 million dollars, fell to 8.2 million, and then jumped to over 25 million dollars; by March 1949 costs already incurred (under a cost-plus contract) had been more than 16.5 million. Evidently in the head offices of neither the Commission nor the Company did highest officials know fully about these increases in costs. When the Commission finally learned of them, it sent a three-man team to investigate. By the time the information had been sent to the Joint Committee in the spring of 1949, the Commission found itself with a construction project whose costs had increased fourfold. Yet even here, the record indicates that the breakdown was within the Commission and the General Electric Company, and not between the former and the Joint Committee.

A direct result of this incident was a "construction rider" attached to AEC appropriations by the Senate Appropriations Committee, imposing certain restrictions on AEC expenditures to forestall another "Hanford overrun." But two features of the atomic energy operations tend to make early cost estimates extraordinarily difficult: one is the novelty of the construction, the other is the need for speed. No one on the Joint Committee seemed to feel that the costs involved in the "Hanford overrun" were necessarily excessive; and the Eniwetok experiments, which took place between the first estimate and the last, partly accounted for a decision to rush construction. It was largely the breakdown in communications that irritated the Joint Committee. And when, following the reports of an atomic explosion in Soviet Russia, the Commission argued that the rider would hamper its progress, the Joint Committee gave full support to a different arrangement for handling technical construction facilities.

We need to know a great deal more about this unique relationship between Congress and an administrative agency. Study of the Joint Committee might throw considerable light on several problems:

First, in the Joint Committee we have an instance of close congressional attention to an administrative activity involving a high degree of secrecy and security. What lessons can we learn from this experience? Does the relationship between Joint Committee and AEC offer a more widely applicable technique for mitigating the effects of secrecy?



Second, the relations of the Joint Committee and the Commission offer an interesting case study of the consequences of a congressional committee attempting to exercise relatively great influence on the operations of an administrative agency. What is the real relationship between Joint Committee and the AEC? And what are the consequences of this relationship? A considerable body of data is available in published hearings and other sources.[9]

[9] Only one relevant research project is known to us. The Memorial-Phoenix Project at the University of Michigan has made a grant to John Lederle for a study entitled "Congress and Atomic Energy: A Study in Congressional Direction and Control."

ROLE OF THE APPROPRIATIONS COMMITTEE

The appropriations committees and subcommittees have evidently not acquired a competence in atomic energy policy comparable with that of the Joint Committee. Consequently much of the time of the appropriations subcommittees, especially in the House, is spent on minor but more easily comprehended matters of policy, such as the operation of AEC towns.

To the student of legislative organization the operations of these committees pose some interesting questions. A joint appropriations committee with a large professional staff of analysts has sometimes been suggested as a device for raising the level of competence in the appropriations process. A quite different development is contemplated by those who propose to strengthen the role of the legislative committee in the appropriations process; and it is the latter which, it is reported, has sometimes been considered within the Joint Committee. There, attention has been given to the idea that the AEC budget might first be submitted to the Joint Committee for approval before going to the appropriations committee for hearings. So far as we know, no research is under way on this subject.

ROLE OF CONGRESS

By the role of Congress, we mean here the role of those members not on the appropriations subcommittees or the Joint Committee—the "lay members" of the legislative body who must pass upon legislation and appropriations. When we consider Congress in this sense, some of the problems already alluded to are vastly multiplied. A preliminary investigation suggests the following questions and hypotheses (among others) for examination:

1. Have the facts of secrecy, calculated risk-taking, and complexity placed atomic energy policy beyond the active consideration of most congressmen? It seems probable that for much the same reasons as prevail for the nonofficial public, congressmen tend to be inhibited or apathetic about discussing or questioning atomic energy policy.

2. Do lay congressmen tend to develop any specific policy views about atomic energy, other than those transmitted to them by members of the Joint Committee? It seems probable that, faced with what they regard as the formidable difficulty of comprehending the issues involved and in the absence of strong public opinion,

in effect most congressmen delegate the making of policy to the Joint Committee or to certain members of it, and perhaps to the appropriations committees.

3. On atomic energy policy, how responsive are congressmen to influences other than those exerted by the Joint Committee—for example, from the President, military leaders, or nonofficial pressure groups?

Legislative action on atomic energy has not been so infrequent as one might suppose. Furthermore, most of the participants are available for interviewing. Nevertheless, the kinds of questions we have raised will be difficult to answer. Although these relationships are of great importance to the political scientist, attempts to go beyond more or less legalistic, institutional-descriptive, historical, or impressionistic discussions are still in their infancy.

ROLE OF THE CHIEF EXECUTIVE AND HIS AIDES

Any attempt to examine the role of the presidency in atomic energy policy may prove unrewarding. What is characteristic of so many presidential relations—at least prior to the memoir and biography stage—is doubly true, no doubt, of atomic energy policy; many of the data needed are fugitive, unrecorded, or secret. Perhaps the central question of interest is this: how much direction does—and can—the Chief Executive exercise over atomic energy policy? Note that President Truman took direct responsibility for going ahead with the hydrogen bomb, and he has an opportunity to influence policy when a vacancy occurs on the Commission or on the General Advisory Committee. On the whole, however, the probability seems great that the President's personal influence on the policies of the Commission is bound to be slight because usually he has neither the time nor the knowledge to do much more than formally approve the Commission's policy decisions.

This does not mean that there are not important influences exerted upon the Commission from within the executive branch. The staff of the Budget Bureau of course examines the AEC budget, and some of our interviews indicated that this has developed into a relatively detailed and forceful examination. The other major influence from within the executive branch is exerted by the National Security Council. Important policy questions, such as the hydrogen bomb and the expansion program, are dealt with by working groups of the Council.

Difficulties in finding data pertaining to the role of the President may render the task speculative rather than definitive, but this does not imply that such research should not be undertaken. In practice, political scientists and others are forced to make assumptions about the role of the chief executive and his aides. These assumptions have great bearing on the conclusions drawn, for example, as to the "appropriate" roles of the executive and legislative branches.

ROLE OF THE DEFENSE ESTABLISHMENT

Are there any significant aspects of the role of the defense establishment in atomic energy policy that are not concealed by security? Probably not much can be learned about the relationship between the AEC and the Department of Defense, or the operation of the Military Liaison Committee. But the AEC's position as part of the defense set-up might bear reexamination.

A useful way to study the Commission might be to ask whether it should not be placed within the Department of Defense, and if not, why not? Why is an AEC problem any different from similar problems that arise within the Department of Defense? What new policy conclusions, if any, are suggested by the answers to these questions after a trial period of more than five years? One might start by putting the atomic energy program in perspective as a minor part of the arms program. A statement prepared by the Joint Committee cites Commission-authorized estimates that 15–20 per cent of postwar atomic energy expenditures have been devoted to peacetime uses.[10] This means that 80–85 per cent have been devoted to military use—in fiscal years 1946–50 inclusive, roughly 1.9 billion dollars for bombs. This amount, however, is only a shade over 2 per cent of total military expenditures for those five years, as calculated by the Joint Committee staff.

ROLE OF ADVISORY GROUPS

The Commission has made extensive use of advisory groups. A General Advisory Committee was established by the McMahon Act. This Committee, whose present chairman is Robert Oppenheimer, meets around six times a year at its own call and occasionally at the request of the AEC; its advice was sought, for example, on the hydrogen bomb. In January 1950 the Commission had no less than eighteen outside advisory bodies; and some of them have produced useful published reports.

In broad terms, what functions are the advisory boards regarded as performing, by the Commission and by the boards themselves? And what functions *do* they perform in fact? Some of the possible functions are: (1) to provide purely technical advice; (2) to furnish advice on policy where questions of both fact and value are involved; (3) to represent the views of a relevant interest-group; (4) to provide a facade of consultation; (5) to serve as channels of influence from the AEC to various publics; or (6) to drain off potential criticism or opposition.

Are the advisory boards sometimes drawn largely from interest groups which tend to share a value position not necessarily shared by the community as a whole? For example, most of the members of the Industrial Advisory Group were, understandably enough, high executives in large industrial corporations; four of the members came from the oil industry.

It is worth reiterating that if purely "technical" questions answerable by "technical" criteria are considered by advisory boards, there may be no serious problems in the relationship of advisory boards to Commission. But if policy questions involving value premises are considered, then the "representativeness" of the particular board or congeries of boards becomes important.

Although there is considerable scattered writing on advisory and consultative committees in public administration, there is little in the way of consistent theory. The experience of the AEC provides some data and, more important, brings into sharp focus some of the questions with which an adequate theory should deal.

More ambitious investigators may prefer to attempt an analysis of the total operation of controls mentioned in this section, their interrelations, reciprocal effects, and total effectiveness. An over-all study would give some opportunity for appraising the relative effectiveness and possible roles of one technique as compared with

[10] The Joint Committee statement relies on remarks by Acting Chairman Pike before the Joint Committee, February 10, 1950, and on a *St. Louis Post-Dispatch* story by George H. Hall, January 30, 1950.

another, and problems arising from their interrelation.[11]

Broadly speaking, two types of appraisal are needed in the atomic energy operations; appraisal of past efforts to achieve some given goal, and appraisal of alternative ways of achieving some goal in the future.

PROBLEMS OF APPRAISAL

How does one know what kind of measuring devices to apply to the AEC? To be sure, the top-secret progress reports sent twice yearly to the Joint Committee are said to specify goals in considerable detail; relative amounts of fissionable products to be produced, costs per unit of output, employees required, and the like. But however much these details may help the Joint Committee, they cannot be of much use to the rest of Congress or the public in attempting to appraise the atomic energy operations.

Even assuming that all our own information were declassified, appraisal would remain a formidable task simply because of the highly technical character of the operations. How can members of the Joint Committee judge whether the General Electric Company is doing a relatively good job at Hanford? There are, as yet, no competitive comparisons to serve as guides. The output of uranium 235 through the gaseous diffusion process at Oak Ridge under the Carbide and Carbon Chemicals Corporation can scarcely be compared with the output of plutonium from the reactors operated by the General Electric Company. Yet the Commision, and presumably members of the Joint Committee and of the executive branch, must have some means of deciding whether good choices are being made in the selection of contractors.

Such historical bases as exist—and evidently the Commission and the Joint Committee chiefly rely on these for "impersonal" appraisals—are all internal to the atomic energy operations. The 1950 rate of output and unit costs can be compared with those for 1945 and 1949. Much of the defense of the Commission during the Joint Committee investigation resulting from Senator Hickenlooper's charge of "reckless mismanagement" was based upon demonstration that outputs had increased and unit costs had declined steadily under the management of the Commission as compared with that of the Manhattan Engineer District. Useful as these data are, unfortunately they are inconclusive. For we may assume an almost "inevitable" rate of technical progress in most production processes in this country; and with an innovation like atomic energy we would expect a rather high rate of technical progress under any except quite incompetent management. To show some rate of technical progress, and perhaps even a high rate, is therefore inconclusive.

In sum, appraisal of past or proposed atomic energy operations is extraordinarily difficult. Yet, in many respects it represents only a special case of an increasingly wide-spread phenomenon in modern society. As society becomes characterized by complex fields like atomic energy, discovery of alternative methods for control and appraisal require extensive exploration. Areas of investigation by those concerned with this problem may be suggested by the following observations:

The very difficulties of appraisal may tend to make the judgment of the informed layman more appropriate than that of the expert.

For the judgment required in such situations is a balancing of margins and probabilities. In this balancing process the competence of the expert may be deficient in two respects. Complicated judgments require a balancing of probabilities in many spheres; and in this kind of judging, the expert may be myopic precisely because he is an expert. Second, complicated questions of policy can only be decided with reference to some set of goals; yet, like as not, these goals cannot be clearly articulated, are compounded of conscious and only partly conscious elements, and are potentially contradictory so that a balancing of margins is required. How can there be an "expert" or "technical" answer to the question whether it is worth while to risk 250 million dollars on this or that reactor development program? But can we even identify the distinguishing characteristics of choices on which the judgment of the layman may be more "appropriate" than that of the "expert"? How can we know a "lay" question from a "technical" question in other than extreme cases? Indeed, how do we characterize the extremes?

The atomic energy operations frequently require a policy decision based on a calculated risk not unlike a military judgment. The concept of calculated risk is essentially as expressed by the Director of the Division of Reactor Development, Dr. Laurence Hafstad:

"This is a game that you can play only with blue chips. If you design a reactor, you find that the darned thing, no matter how you design it, costs in the neighborhood of 25 million dollars or something like this, and you are going to think two or three or maybe six times before you design a reactor for 25 million dollars and then have the thing fail. You have got to make your bets so sure that a group of people who are qualified and have their reputations at stake will really say, 'I believe that this thing will work; let's go ahead with the project.' "[12]

Is it possible to distinguish different viewpoints toward risk-taking that tend to be represented in the executive branch, in Congress, and in business? There is much evidence, in the hearings, of differences that are subtle but nevertheless full of consequences for policy.

The atomic energy operations were originally, as is well known, almost an autonomous affair carried on in the midst of a world war. Probably the personality of the President had a great deal to do with his initial decision to risk huge resources on a gamble. But also, it may be suggested that attitudes in the executive branch may be more favorable to calculated risk-taking than in Congress. In appraising a 300,000,000 war-time construction of two plants for isotopic separation of U-235, both of which proved to be inefficient, the majority report on the 1945 investigation of the AEC said: "The large investment which both plants represent was eminently justified in terms of wartime emergency and the *state of knowledge existing at the time construction began.*"

Here we have *post hoc* congressional approval of the calculated risk in wartime. Today, would there tend to be more criticism of such an action in Congress than in the executive branch?

To the extent that the executive branch is forced to anticipate such criticism, it may become less bold in its risks. Thus, after the Hanford overrun had been aired, H. A. Winne of the General Electric Company testified:

"We are going to insist in the future that we make no project estimates which are accepted as such until we

[11] A short chapter on "Problems of Communication is omitted from this abridgement.

[12] "Reactor Development (Excerpts from remarks and discussion in a press seminar in March, 1949)," (Washington: U.S. Atomic Energy Commission, mimeographed).

have the design far enough along so that we can make such an estimate, and that means 75 per cent or so along."

But it is possible that on some kinds of policy issues, congressmen (including members of the Joint Committee) are more willing to take risks than members of the Commission. We have the impression that congressmen constituted a strong source of pressure to develop the hydrogen bomb; that their pressures speeded the decision to go ahead with that gigantic gamble; and that the technical difficulties and uncertainties generally loomed larger to technicians and administrators than to politicians.

One additional factor should be taken into account in strengthening the opportunities for taking bold risks. This is the high prestige of the scientist combined with the professional "code" within which he operates. The fact that the scientist is regarded as an individual without commitments or vested interest except in "scientific truth" probably tends to soften criticism of calculated risks that turn out badly under his auspices. This no doubt partly accounts for the lack of criticism about the investment of 300 million dollars in Y-12 and S-50 at Oak Ridge. Can the significance of indications of diverging viewpoints on calculated risk be determined through research? Careful study of differences found to exist might suggest methods for facilitating the cooperation and mutual understanding of participants in the policy-making process. For example, it might be possible to develop a "reasonable administrator" concept of appraisal which, with time and repetition, would help to narrow the gap between executive and legislative appraisals of the administrator who takes a calculated risk and fails.

How are appraisals actually made in this complicated area? An obvious preliminary assumption is that those making appraisals must and do rely heavily on impressionistic clues about the people and organizations involved. Reputation and previous accomplishments, public statements, apparent attitudes, mannerisms, ethnic background and status group origins, group loyalties and identifications, judgment on certain "key" issues, and probably other less evident factors may all provide such clues.

To examine this assumption, one might well undertake an analysis of the factors involved in the confirmation of the commissioners. The hearings on this question are fortunately rather extensive, and there are several interesting cases. One might also examine the factors in the action of the Republicans prior to the 1948 elections, when the terms of the Commissioners were about to expire. The Republicans were anxious to avoid having a Commission with a majority of Democratic members after an election in which they, the Republicans, were presumably to be victorious. This could only be accomplished by refusing to make appointments until after the elections. The Republicans therefore passed a bill extending the terms of the members of the Commission.

Why all this manipulation? The possibilities of political patronage in the AEC are negligible. Did they want a Republican "dominated" Commission rather than a Democratic one? Were there important policy differences between Democrats and Republicans on atomic energy? Evidently not at the articulate level; but many Republicans undoubtly had anxieties about Lilienthal, the symbol of the New Deal, government power, and the TVA.

At another level the AEC is moving with considerable speed toward the development of cost data that may assist appraisal better than what its officials believe are antiquated systems peculiar to many government departments. An important by-product of the AEC accounting system is a cost-type budget, which was introduced with its 1951 estimates, perhaps the first of its kind in the federal government. This change permits the AEC to shift to current costs and away from obligations to be incurred in a given budgetary year, which is the normal basis of the federal budget.

Despite these developments, there are still great difficulties involved in appraisals through cost-accounting methods. Unit costs on fissionable materials which are being developed must necessarily remain top-secret information so long as important American techniques are intended to be kept secret from other nations. And even if unit costs on the uranium and plutonium operations were revealed for the entire life of the projects, it would be difficult to appraise their meaning.

Eight points appropriate for possible further investigation are:

(1) The difficulties of appraisal may in many cases make the judgment of the layman more appropriate than that of the expert.

(2) What are the distinguishing characteristics of choices on which the judgment of the laymen is more appropriate?

(3) The atomic energy operations frequently require a policy decision based on a calculated risk.

(4) There tend to be significant differences in viewpoint between executive branch, Congress, and business on taking calculated risks. These differences are further complicated by the prestige and role of the scientist.

(5) We know very little about how appraisals are actually made on complicated policy and technical issues like those in the atomic energy operations. But it seems likely that the more complex the operation, the more important "subjective" appraisals become.

(6) Given the difficulties of appraisal in atomic energy operations, a rather heavy reliance must be placed on advisory groups.

(7) The AEC is developing cost data that may assist in the task of appraisal. But here, too, there are significant differences between congressional, executive, and business viewpoints.

(8) The hydrogen bomb project and the consequent expansion of uranium and plutonium output may make possible comparative appraisals of contractors.

We have no clearly formulated theory about most of these questions and there have been almost no relevant empirical studies. To our knowledge, no such research focused on the AEC has been or is being undertaken.

Editor's Note—

The summary of this report will be continued in later issues of the Bulletin.

MAJOR ACTIVITIES IN U.S. ATOMIC ENERGY PROGRAMS, JANUARY-JUNE, 1951

A SUMMARY OF THE TENTH AEC SEMIANNUAL REPORT

Prepared by ANTHONY TURKEVICH

PROBABLY the most significant part of the *Tenth Semiannual Report* of the Atomic Energy Commission, issued July 31, 1951, is the financial section. The expanding tempo of the Commission's activities is illustrated by the table listing the "funds appropriated to AEC for the last three fiscal years. . . :"

	Million Dollars
1949	621.9
1950	702.9
1951	2,032.1

How this money was spent in detail is, of course, secret. The report, however, includes a series of totals for the fiscal year ending 1950 that indicate roughly the apportionment of this money for that year. Out of the 702.9 million dollars, the net cost of operations for the year was 414.8 million dollars, broken up as indicated in Table 1. The remaining 288.1 million dollars went primarily into expansion of facilities.

TABLE 1

PRINCIPAL ITEMS IN OPERATING COSTS OF THE AEC DURING FISCAL YEAR ENDING JUNE 30, 1950

Scientific and technical costs:		
Source and fissionable materials program		$120,416,680
Weapons program		85,832,512
Reactor development program		27,596,200
Physical research (less radio-isotope sales of $222,130)		31,128,252
Biology and medicine program		17,687,416
Total		$282,661,060
Auxiliary services and other indirect expenses:		
Community operations:		
Gross costs	$21,356,977	
Less revenue	15,551,590	
Total		$ 5,805,387
Program administration		22,092,169
Depreciation		97,019,242
Total		$124,916,798

The manner in which the greatly increased appropriations of the fiscal year 1951 were spent is indicated merely by the statement that "construction and equipment accounted for nearly three-fourths of the more than 2 billion dollars." This means that net operating costs were not too dissimilar from 1950, but that the atomic potential of the United States (as measured by the value of installations) was to be 70 per cent greater as a result of the year's construction and equipment procurement program. Specifically, it is merely stated in the report that "work progressed at the two major production plants in South Carolina and (Paducah) Kentucky." The latter is to be the site of a new gaseous diffusion plant to separate the isotope U^{235} from the natural mixture of uranium isotopes. The South Carolina site is on the Savannah River near Augusta, Georgia.

WEAPONS TESTS

Among the highlights of the operations during the first six months of 1951 were two sets of weapons tests conducted by the AEC. The first set, described as "limited-scale weapons tests," were held near Las Vegas, Nevada, and represented "the first nuclear weapons tests in the continental United States since the original atomic bomb was fired at Alamagordo, New Mexico, in July, 1945." These were conducted "with logistic support by the military services."

The second set, described as "full scale," were conducted jointly with the Department of Defense at the Eniwetok Proving Grounds in the Pacific's Marshall Islands in April and May. "Operation Greenhouse," the code name for these Pacific tests, required almost 9,000 persons drawn from AEC and Department of Defense personnel, and the moving of 250,000 tons of supplies over distances of more than 4,500 miles. Among the advanced

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techniques used during these operations were the use of "radar-directed drones"[1] to collect observations in and near the radioactive clouds that follow atomic explosions, and the use of jet-propelled drones.

"Information obtained on phenomena associated with nuclear detonations, the major purpose of the tests, cannot be reported publicly, since such facts are restricted data. Other experiments were carried out to determine the effects of atomic radiation, burns, and blasts on living things, and to obtain additional data as to the effects of atomic weapon explosions on structures, aircraft, and various materials." The detailed results of these experiments are not yet available.

"Experience in the 1951 tests of atomic weapons demonstrated definitely that lingering radiation need not delay rescue and recovery work after bombing by high air bursts. Direct radiation from a high air burst disappears almost immediately as the radioactive cloud rises into the stratosphere, and no dangerous residual radiation is left at ground level. A burst close to the ground leaves considerable residual radiation in an area 300 to 400 yards in radius, but destruction within this circle would be practically complete.

"After explosions in the 1951 Eniwetok tests, many scientists and technicians returned to the test sites promptly by helicopters and speed boats for periods long enough to recover instruments and specimens. Within 24 hours after one explosion, construction employees, under radiological safety control, were able to begin work on new barracks 1,000 yards from the point of detonation. The barracks were occupied 72 hours later."

RAW MATERIALS

The situation in this important aspect of the Atomic Energy Commission program is indicated in the report as satisfactory. Besides the well-known sources of uranium (Canada, Belgian Congo, and Colorado) which are being heavily tapped, new ones are being developed. Plants are under construction to extract uranium from gold ore residues in the Union of South Africa. The United States will have the opportunity to buy this product. Domestically, it appears as if uranium may be extracted as a by-product of the fertilizer industry in Florida, and plans have been announced for a plant to do this. The AEC is continuing through expanding exploration and greater incentives in subsidies and bonuses to develop new domestic sources of the basic raw materials.

REACTOR DEVELOPMENT

Besides the production reactors (progress and development of which is secret), the Commission reports progress in (*a*) the design and construction of new reactors, (*b*) experiments with new types of reactors, and (*c*) long-range studies to evolve a program of future development. The general situation was described in a previous semiannual report.[2] The most marked progress since then has been at the Reactor Testing Station in Idaho. At this site two new reactors were close to completion.

One of these, the Experimental Breeder Reactor, is novel in several ways. It will operate with "fast" (relatively high energy) neutrons, in contrast with all the previous major reactors which have used "slow" or thermal neutrons. It will test the possibility of "breeding," i.e., the production of more fissionable material than it consumes. Finally, it will be the first reactor in this country to produce experimental amounts of power.[3]

Besides direct reactor development, the "AEC this year initiated studies to find industrial uses for the radioactive wastes from reactor operation. Under AEC contract, Stanford Research Institute, Stanford, California, distributed a prospectus for industrial management, 'Putting Atoms to Work Through the Use of Fission Products,' and interviewed a 10 per cent sampling of the 500 or more who received the prospectus. A report on the interviews and voluntary replies is being prepared.

"The prospectus points out five principal capabilities of fission products: they can (*a*) kill organisms, (*b*) induce chemical reactions, (*c*) ionize gases, (*d*) activate phosphors, and (*e*) produce rays which can penetrate solids. It also lists some uses these properties suggest: radiography; sterilizing foods and drugs in containers without heat; producing new or cheaper chemicals, improved static eliminators and fluorescent lights, and new types of luminescent paints and tiles; tracing of pipeline flows. Some of these uses are speculative; others already have been developed with other sources of radiation.

"General research projects were established at University of Michigan, Columbia, and Yale universities, and Massachusetts Institute of Technology to investigate use of fission products to facilitate chemical reactions, to preserve foodstuffs and sterilize pharmaceuticals, and to study effects on the human body. Brookhaven National Laboratory will prepare radioisotopes for pilot use in these investigations and will coordinate research by other institutions and industry as well as conduct some investigations of its own."

PHYSICAL RESEARCH PROGRAMS

Under this heading the report covers three main topics: the construction of new machines for nuclear research, the support of students training in science, and actual progress in research.

The first part of 1951 saw the authorization of a new research reactor for the Argonne Laboratory and the completion of three accelerators financed partly or entirely by the AEC. Two of the latter were cyclotrons at Brookhaven National Laboratory and at Oak Ridge National Laboratory. The third, at the University of Chicago, financed in part by the AEC and the Office of Naval Research, is a synchrocyclotron. At present it is the source of the highest energy artificially accelerated particles in the world (250 Mev deuterons and 450 Mev protons).

In the fellowship program, "the Oak Ridge Institute of Nuclear Studies will administer the AEC fellowship program for the academic year 1951–52 with the aid of the National Research Council, which assesses applicants' qualifications.

"The Fellowship Board of the Institute selected 287 new fellows, pending FBI investigation and AEC security approval:

Physical Sciences—predoctoral	156
Physical Sciences—postdoctoral	30
Biological Sciences—predoctoral	69
Biological Sciences—postdoctoral (including Medicine)	32

The Fellowship Board also named 31 alternates in the physical sciences who will be appointed if other appointees are withdrawn. A considerable number of reappointments will be made of predoctoral fellows originally appointed for the 1950–51 academic year.

[1] "Drones" are unmanned aircraft controlled electronically from the ground or from a "mother" aircraft.

[2] See *Bulletin*, VII (June 1951), pp. 177–78.

[3] The Experimental Breeder Reactor has since been announced as having started operating, and as having produced experimental amounts of power.

"AEC plans to decrease its general fellowship program, and eventually to liquidate it, except in some specialized fields. The AEC recognizes the great need for this type of training, but feels that the type of training it previously sponsored can be administered by such an organization as the National Science Foundation. The National Science Foundation is beginning to develop a fellowship program for the academic year 1952–53."[4]

Probably the most interesting single piece of unclassified research at the AEC during the first part of 1951 was the work with helium 3. This substance "was solidified for the first time recently at Argonne. The experiments verified that liquid helium 3, unlike all other liquids except helium 4, cannot be frozen by cooling alone.

"Before helium 3 could be solidified, it had to be cooled to 457 degrees below zero Fahrenheit, and then subjected to a pressure of 600 pounds per square inch. Results indicated that even at absolute zero—459.7 degrees below zero—it would be necessary to apply a pressure of 400 pounds per square inch.

"Research on helium 3 is handicapped because of its scarcity in nature. It exists as only one part per million of ordinary helium. Argonne's work was made possible because the laboratory has small quantities of helium 3 as a decay product of radioactive hydrogen (tritium) made in atomic piles. The quantity of helium 3 used in these experiments was so small that solidification was carried out in tubing about the thickness of a human hair."

ISOTOPE PROGRAM

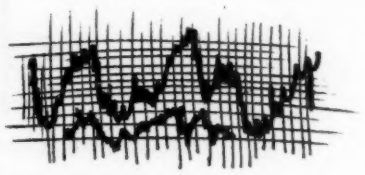
"Manufacture and distribution of radioisotopes, one of AEC's major contributions to the national welfare, continued to expand during the last six months. More than 1,000 departments or laboratories in over 500 institutions in the United States are using radioisotopes. They are shipped to 46 States, the District of Columbia, and Hawaii, and to 175 institutions in 31 foreign countries.

"Oak Ridge National Laboratory has made more than 18,000 shipments of radioisotopes to users in the United States and 1,000 to foreign users since August 1946, when distribution started. In addition, 4,000 shipments have gone to AEC installations.

"Radioiodine and radiophosphorus continue to head the list of radioisotopes distributed, but during the last ten months ORNL made four times as many shipments of radiocobalt (Co 60) as during the preceding four years. Industries are using this radioisotope in increasing quantities in much the way that X-ray machines are used—as a source of penetrating gamma rays for radiographic testing of their products and processes.

"Between August 1946 and May 1951, ORNL made 6,000 shipments of radioiodine totaling 631 curies, 5,000 shipments of radiophosphorus totaling 220 curies, and 350 shipments of radiocobalt totaling 607 curies."

Besides the actual shipments, the AEC is continually seeking to expand its services in the isotope program. For example, frequent users of radioactive isotopes (users of more than twenty shipments during a year) are being given simplified procedures and local responsibility for safety. Likewise, the AEC has started a registry of isotope-labeled compounds and a program for stockpiling some of these compounds.



Because synthesis of a particular isotope-labeled compound is often a stumbling block in the use of a radioisotope, this service should be a big help.

"AEC in July announced that to assist in extending the scope of international cooperation in science it had enlarged its radioisotope export program. It will sell radioactive materials abroad on the same general bases as in this country, and, for the first time, make U.S.-produced radioisotopes available to foreign users for industrial research and applications. This action increased from 26 to 99 the number of AEC isotopes available to buyers in foreign countries.

"At the same time, AEC authorized American manufacturers to export radioactive thickness gages, which are finding increasing application in a number of different industrial processes.

"The new isotope program also permits Oak Ridge National Laboratory to provide scientists of other nations with special irradiation services, whereby they may send materials to Oak Ridge for exposure to neutron radiation in the nuclear reactor.

"The Commission felt that enlargement of the isotope export program was in keeping with the foreign policy of the United States, that, even in the absence of international control of atomic energy, this constituted a field in which international cooperation could be increased. While utilization of radioisotopes in the forms in which they are sold cannot significantly advance the atomic energy programs of nations, it can contribute to advancements in basic science, medicine, agriculture, and industry."

MEDICAL APPLICATIONS OF ISOTOPES

The report describes some of the uses to which radioisotopes are being put. Included is a summary of the medical applications since 1940:

"Over 1000 cases of *polycythemia vera*, a disease in which red blood cells multiply very rapidly, were treated with radiophosphorus in the decade 1940–50. Over 85 per cent of the patients were benefited for periods of six months to more than nine years. In two-thirds of the cases, relief lasted about two years.

"Over 1,000 cases of *leukemia*, a disease in which white blood cells are overproduced, were treated with radiophosphorus during the decade. Life may not have been prolonged by radioisotope therapy, but the comfort of many patients was greatly improved.

"Over 1,000 cases of overactivity of the thyroid gland were treated with radioiodine in the ten years. It was reported in the medical literature that 95 per cent of *hyperthyroidism* cases can be satisfactorily controlled in this way. It was also reported that radioiodine therapy is now considered the first-choice treatment for patients who are sensitive to antithyroid drugs or whose cases are complicated by heart disease.

"Approximately 100 cases of *thyroid cancer* were treated with radioiodine. About 15 per cent showed good clinical response."

BIOLOGY AND MEDICINE

AEC placed special emphasis during the first half of 1951 on research in radiation protection and treatment of radiation injuries. Extensive biological experiments were included in the Eniwetok tests (see above). In addition,

[4] As announced in the December *Bulletin* (p. 382) about 400 graduate fellowships are planned for 1952–53. The inadequacy of this program—a result of the failure of the NSF to obtain adequate appropriations—is pointed out in the McMahon Interview. See page 8.

AEC continued work on beneficial application of atomic energy to medical and agricultural work. This work was carried on both at AEC-owned or financed laboratories and through research contracts at 111 universities and other institutions. Support of the entire field of biology and medicine used up approximately 20 million dollars. An additional investment of 8 million dollars was made in laboratory facilities.

"The Atomic Bomb Casualty Commission, directed by the National Research Council of the National Academy of Sciences and financed by AEC, completed three years of medical study of Hiroshima and Nagasaki survivors and possible hereditary effects on their children. Recently completed modern laboratories at the two cities went into full operation. A detailed census of all persons in the cities at the time of the explosions was completed. Facilities are in operation for analyzing the voluminous statistics accumulated in this study.

"Full scientific conclusions in this long-range project will require a number of years, but certain trends are already apparent. Among survivors who were within 1,000 meters of the points below the explosions, radiation cataracts have been found in about 10 per cent. By contrast, the frequency of this eye disease in normal urban populations in Japan is believed to be less than 1 per cent.

"Leukemia, a fatal blood disease, apparently appears more frequently among Hiroshima and Nagasaki survivors than among other Japanese. A very real increase of this disease was found among survivors within 2,000 meters of the points below the explosions.

"No unusual kind or striking frequency of hereditary abnormalities has been noted to date in children of Hiroshima-Nagasaki survivors. Years more of study will be required, however, before definite conclusions can be drawn as to the genetic effects of atomic bomb radiation.

"A new contract for direction of ABCC work was signed with the National Academy of Sciences, effective July 1.

"At the request of the National Security Resources Board (in charge of civil defense until December 1, 1950), AEC late in 1950 began lending radiation instruments to state and local agencies for civil defense training.... The instruments were drawn from a stockpile built up for emergency use in AEC plants and laboratories."

Among the specific results of medical research may be mentioned confirmation "of the important role that an organ in the abdominal cavity, the spleen, plays in combating the ill effects that follow heavy exposure to nuclear radiation. Three groups of mice were used in the experiments. The spleens of one group were brought to the surface of the body by surgical operations, and surrounded with lead shields. A second or 'control' group were not given this protection.

"Both groups were then exposed to 1,025 roentgens of nuclear radiation, an amount that ordinarily would be fatal. This exposure actually was fatal to 100 per cent of the unprotected group, but half the mice with shielded spleens survived.

"The third group of mice were provided with spleen shields and also treated before radiation with cysteine, a sulfur-containing organic material which in some way not yet known strengthens the body's defenses against radiation damage. With this dual treatment, the survival rate went up to 95 per cent.

"The same experimenters found that by transplanting sections of healthy mouse spleen into the abdominal cavities of mice promptly after their whole bodies, including their spleens, had been damaged by radiation, they could greatly reduce the number of mice that died. Similar results were obtained by removing embryos from healthy female mice, reducing them to a juice, and injecting this material into mice that had undergone radiation exposures in amounts that ordinarily would cause death.

"Spleens and embryos of normal mice apparently contain a protective principle of unknown nature which helps to maintain the production of red and white blood cells but is disrupted by heavy radiation exposure. Work is under way to isolate and identify this active principle.

"Spleen shielding before radiation has so far proved practical only under laboratory conditions. The degree of success achieved by injecting splenic or embryonic material after exposure, however, suggests that a method may be found for saving people exposed to heavy radiation during atomic bombings or radiological accidents."

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SCIENTIFIC MANPOWER

LEONARD I. KATZIN

IN AN earlier article, published in the August issue of this journal the writer drew attention to the increased demand, in the last forty years, for educated and thoughtful citizens, and presented some of the statistics available on the present needs for, and supply of, scientific and technical experts. Since then there has appeared a symposium on "The Human Resources of the U.S.,"[1] embodying the discussions of eight experts on the subjects of Population, Labor Force, Intellectual Resources, Youth, Mobilization, and on the special topics: Engineers, Scientists, and Doctors. Some of the points made are worth special emphasis for readers of the *Bulletin*.

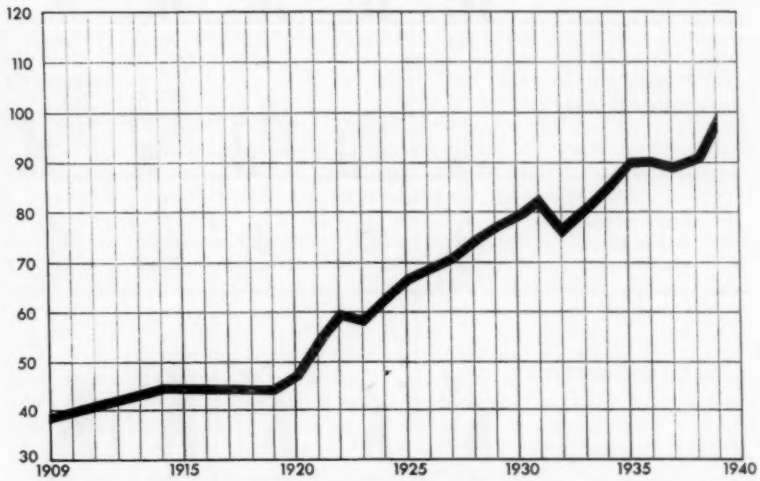

FIG. 1.—*Productivity of the labor force increased steadily from 1909 to 1939. This diagram shows the rise of productivity per man-hour in manufacturing. The numbers at the left are an arbitrary index. The diagram is not carried beyond 1939 because of the difficulty of comparing productivity statistics in situations of war and peace. Productivity per man-hour has increased at an even greater rate since World War II.*

POPULATION

As pointed out by Frank W. Notestein of Princeton University, the United States population of 1850 was 2 per cent of the world population, while the 150 million of 1950 constituted some 6 per cent of the world figures. During this same time in which both the absolute and relative numerical importance of the country's portion of the world population was increasing, other important changes were taking place. From the large preponderance of rural population one hundred years ago (twenty million against three million urbanites) the balance has shifted until our present population consists of ninety-five million urbanites, thirty million rural nonfarm population, and twenty-five million rural farm population. This shift of course reflects the increasing industrialization of the country.

The fertility of the population, perhaps reflecting the increasing urbanization, has dropped steadily from about 55 births per thousand of population in 1800 to the low of 18 per thousand per year in the interval 1933–39 (there has been a slight upturn since). This, combined with improved life expectancy due to public health and personal medical advances have altered the age distribution of the population. The group aged 70 years and up, for example, has increased from approximately two million in 1900 to about seven and one-half million in 1950, almost a factor of four, while the total population only doubled. The median age of the population as a whole has risen from 22.9 in 1900 to 30.1 in 1950.

LABOR FORCE

The implications of increased efficiency in the almost constant value for the rural farm population during a period in which the total population increased approximately sevenfold are unmistakably verified by Ewan Clague, Bureau of Labor Statistics. We have sixty million in our labor force now, as compared with approximately twenty-seven and one-half million in 1900, yet the figure of eleven million farmers and farm laborers in 1900 is several millions more than the present number. With the help of mechanization, the reduced labor force today produces far more food and fiber than did the larger farm manpower of 1900. Efficiencies have increased in fields other than agriculture, too, as the productivity per man-hour increased more than two and one-half times in the thirty years from 1909 to 1939 (Figure 1).

Some of the factors and trends can be seen in Figures 2 and 3: The biggest change in emphasis between the distribution of labor in 1900 and 1950 is shown in the decreased proportion of the agricultural labor force, and the dramatic increases in the proportion of the force in wholesale and retail trade, and the service industries. (Consider, for example, the nonexistence of electronic and electrical home appliance manufacturing and sales in 1900 and their importance in the economy today). Broken down an-

[1] *Scientific American*, September, 1951. The *Bulletin* wishes to thank the publisher of *Scientific American* for permission to quote extensively from the symposium and to reproduce the graphs used in this summary.

Mr. Katzin, who covers Scientific Manpower News for the Bulletin *is senior chemist at Argonne National Laboratory.*

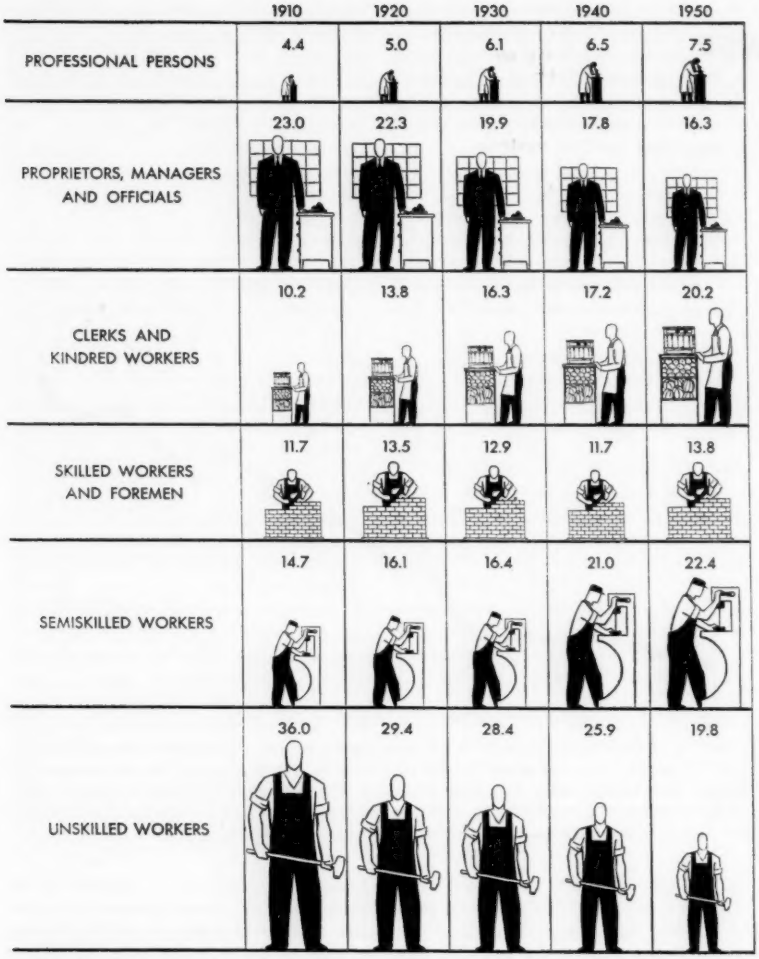

FIG. 2.—*Kinds of workers in the labor force have similarly changed. At the left in this diagram are the various kinds of workers. Each vertical column shows the composition of the labor force at the turn of a decade in this century. The number of each box is the percentage of workers in that category in that year; the size of the figures in the boxes corresponds to the numbers. Reflecting the increasing specialization of the labor force is the decrease in the percentage of unskilled workers and the increase in semiskilled workers and professional persons.*

other way (Figure 2), the importance of unskilled labor in the present age of mechanization has been greatly diminished, with the needs for semiskilled workers and other trained categories reducing this formerly dominant group to only third in importance. To a large extent the increase in the group of clerical workers seems to be at the expense of the proprietor-or-manager-official category, a symptom perhaps of the increased proportion of large-scale business enterprises. But, to quote Mr. Clague: "Even more spectacular has been the rise of that comparatively small but vitally important group—the professional, semi-professional and technical worker. At the turn of the century, this whole group numbered only about 1.2 millions; now it has grown to almost five million and is still expanding rapidly. This is the group which, generally speaking, has always captured the best brains in the nation. In leadership and influence its significance, even in purely economic terms, runs far beyond its numbers."

In his conclusions, Mr. Clague points out that all these facts have affected the labor productivity of the country, which is estimated to have increased at the rate of 2 per cent a year for the fifty years since 1900. It is this increased productivity that is mainly responsible for the nation's present high standard of living and its position as the outstanding industrial machine in the world, with 6 per cent of the world's population producing nearly half of the world's economic product. In part, this accomplishment rests upon the fact that U.S. labor force in general is probably the most highly trained, experienced, resourceful and flexible in the world. It is important to note, however, that American labor also has a superior supply of tools and equipment with which to work. We also have some serious problems. "At a time when the school population of the nation is rapidly increasing, due to the rise in the birth rate, we are confronted with a growing shortage of teachers and declining quality in the teaching staff. . . . The evil economic effects of such a decline will be felt ten to twenty years from now when these young people join the labor force. Beyond this, there is the expanding need for skill that our increasingly complex economy imposes on us. Already we are seriously short in some fields, particularly certain professions and skilled trades, in which the necessary manpower cannot be supplied quickly because of the long training required. The demands of our emergency mobilization, both military and civilian, have made this problem acute. . . . Our major strength, quite clearly, lies in our long-run potentialities. In the last analysis, the power and leadership of the U.S. will rest on the crucial question of whether we can continue to increase our productivity at as high a rate in the future as we have in the past, and this means productivity not only in material goods but also in the services, ideas and educational advance that have made us a rich and great nation."

INTELLECTUAL RESOURCES

Dael Wolfle, psychologist and director of the Commission on Human Resources and Advanced Training, discussing our "intellectual resources," reminds us that the scientific and intellectual advances of a nation are generated by a comparatively small number of people. "These few—the inventors, scientists, thinkers and scholars who have given us the Declaration of Independence and atomic energy, railroads and radar, antibiotics and masterpieces of music and literature—have contributed to civilization out of all proportion to their numbers." To be more specific: "As a rough definition of our intellectual manpower let us say that it comprises all those

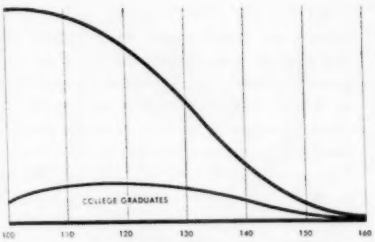

FIG. 3.—*Distribution of college graduates on the AGCT scale is shown by the curve near the bottom of this diagram. The curve that begins at the upper left represents Distribution of Intelligence as based on the scores of the Army General Classification Test. The area between the two curves approximates the proportion of people of better-than-average intelligence who do not go to college.*

who work primarily with their brains. . . . Individually the members of this group vary greatly in their intellectual contributions to society. But in general these are the people who have ideas, develop new inventions, processes and products, manage the nation's social, intellectual and administrative machinery, run its industry and commerce and train others for these complex tasks. . . . Their scientific discoveries, inventions and social improvements have created new demands for engineers, scientists, social scientists, historians, scholars and other men of ability and training who can manage our ever-more complex society. Our problem is: Where are we to find the resources to meet these additional demands? How many people have we who are capable of making creative contributions? How effectively are we discovering and utilizing our intellectual potential? Can we increase our intellectual manpower?"

In considering these questions, Wolfle uses a college degree as an admittedly rough measure of training for intellectual work. To answer the question of where one might get more persons capable of such work, to satisfy predictable increased need and demand, recourse is had to the scores obtained on the Army General Classification Test (Figure 3). On comparing the scores of college graduates with those of the general population, it is seen that of the population with comparable test scores, the college graduates comprise less than one-third, and perhaps less than one-quarter. Considering the more advanced degree, the Ph.D., it seems that less than one-fiftieth of those capable of attaining such a degree actually do so. The conclusion, therefore, is that "We can have more engineers, more scientists, more doctors, more scholars and more specialists of all types if we need them. To obtain them, however, we must do better than we have done in the past to identify the brightest youngsters, encourage them to plan on higher education, offer them a chance to work in their chosen fields, give them financial assistance when necessary, and give them the kind of education that will allow them to go ahead rapidly to take their place among America's intellectual leaders."

SCIENTISTS AND ENGINEERS

The shortage of engineering specialists and scientists has been discussed in this column before, largely on the basis of the same statistics as are used in the *Scientific American* articles by Karl T. Compton, of the Massachusetts Institute of Technology, for the engineers, and M. H. Trytten, of the Office of Scientific Personnel of the National Research Council, for the scientists. One aspect of the problem which it seems to the writer is insufficiently stressed by either article, is the importance of and need for nurture of basic, pure, non-applied and non-programmatic science. It is relatively easy to see, understand, and give support to work of applied or programmatic nature, but as has been said many times since the termination of the wartime programs in radar, atomic energy, and other applied topics, we are at the bottom of the barrel in our supply of new fundamental ideas and discoveries, the things which cannot be written down in grant applications and annual programs or budgets.

DOCTORS

The problems with respect to medical doctors are somewhat different, states Alan Gregg, Director of Medical Sciences in the Rockefeller Foundation. There is no dearth of potential supply of doctors, or more accurately, of aspirants for medical degrees. As a potent factor, one needs only consider that the average net income of physicians in civilian practice in 1949 stood over $11,000. There are problems engendered by the length of time needed for medical preparation, and the cost of this education, but in spite of this there are four times as many applicants for positions in medical schools as there are places. Dr. Gregg feels, however, that the most important thing we can do to increase the number and quality of doctors is to give more financial support to the medical schools.

MOBILIZATION

The mobilization problem, according to Arthur S. Flemming, of the Office of Defense Mobilization, can

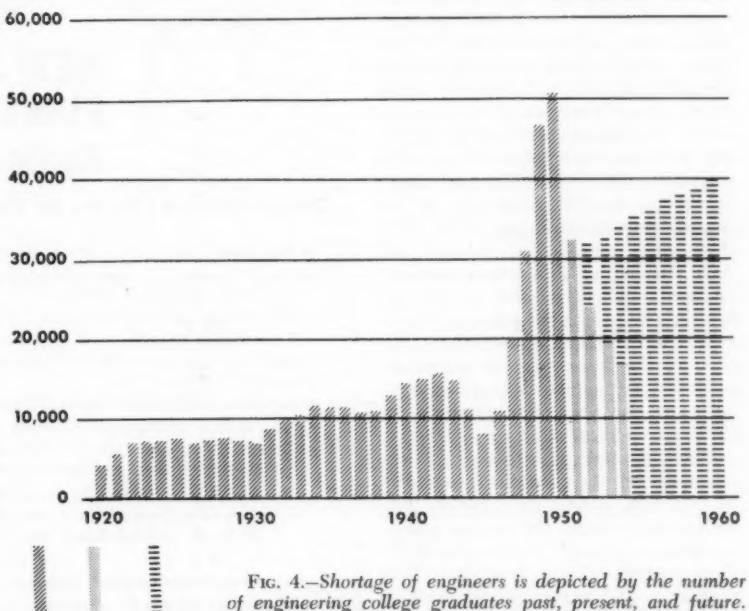

FIG. 4.—*Shortage of engineers is depicted by the number of engineering college graduates past, present, and future. The demand will increase, but a sharp decrease in enrollment prophesies a similar decrease in graduates. The number of graduates is not forecast beyond 1954.*

be stated quite simply: By 1952 we have to gather an armed force of 3.5 millions (or more) and an additional 4.5 millions of workers in the arms and military production programs—without seriously weakening our economy or our long-term vitality as a nation. At the peak of the war-effort in April, 1945, there were 66.2 million in the labor force, including twelve million and more in the armed forces. Our present labor force is very close to sixty million. Some of the difference represents the number of women working outside the home, at that time; another portion consists of men normally considered too old for jobs, and schoolboys employed part-time. Such a state of mobilization cannot be maintained except on a short-term basis. On a long-term basis of operation, we must take special pains to use our trained people for the work they are best fitted to do, and efforts must be made to persuade those with the necessary aptitudes to train to their best levels, to help fill the gap between demand and supply.

YOUTH

But after we have used all our expedients, and juggled all of the factors we can control, will we not reach a limit? Is our future not circumscribed? George D. Stoddard, President of the University of Illinois, has words of hope for us, reminding us of recent studies showing the importance of the environment on intellectual achievement, even as measured by "intelligence tests." Children of apparently mentally inferior stock, brought up in foster homes under favorable economic conditions, given good schooling and social environment, not only surpassed the intelligence quotients of the parents but even that of the general population. Some of the children were very bright indeed, and only ten out of a hundred adopted children studied fell below the national average in intelligence quotient. Other studies have shown that children of the same type of parentage kept in poor homes or poor orphanages do not improve, but tend to decline in mental ability.

"The psychological and social implications of these results are clear. In the first place, they prove that we cannot measure the mental ability of children through measurements of their parents. Every newborn child receives a new pattern of genes. The only reliable way to discover how good this pattern may be is to measure directly the growth of the child under favorable circumstances. . . . In brief, the theory that a child is tied to the mental level of his parents is no longer tenable. A child born to a secure family, sent to a good school and exposed to a high level of aspiration approaches maximum mental power. The same child, placed in degrading, frustrating situations, will approach a minimum. The structure of the brain allows for a wide range of delivered mental ability."

Eventually, of course, even this source of intellectual enrichment of the nation may reach its limit in the genetic pattern of the human material at hand, but no nation on earth is close enough to such a state to justify discussion of the question at that level. The goal envisioned by Dr. Stoddard is still sufficiently remote to constitute a serious challenge for some time to come.

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News and Notes

by **Peter Axel**

ATOMIC ENERGY COMMISSION

Possible AEC expansion, the nuclear powered submarine, the breeder reactr, and tactical weapons were all briefly discussed at the AEC press conference on December 10.

Possible expansion is being studied and will be the subject of a report to Congress in early January. There is more than enough raw material (uranium) to support a 150 per cent expansion. One major bottleneck, in addition to the limitation placed by the size of the appropriation, is the shortage of manpower—"engineers and chemists and physicists."

The development of a nuclear powered submarine is "going along very nicely." The AEC would give no expected completion date. However, the Navy announced on December 12 that the completion date "was estimated to be in 1954." Included in the Navy announcement was the name chosen for the submarine, "Nautilus."

The Breeder Reactor at Arco, Idaho, was reported as running in a preliminary fashion. On December 29, the AEC announced that 100 kilowatts of useful electrical power had been generated from this nuclear reactor. The AEC emphasized that although this was the first known successful nuclear production of electricity, this success did not imply that the procedure was as yet an economically feasible one.

The fact that even a "small A-bomb" has large destructive force was established in the following exchange:

QUESTION: Is it true that your smallest atomic explosions that you have set off are not small by comparison with conventional explosives? Is that reasonable?

CHAIRMAN DEAN: Yes, Sir.

QUESTION: You are not making blockbusters?

CHAIRMAN DEAN: No. There are well-established means of doing that.

Commissioner Smyth sparred with the reporters on the question of whether a critical mass of fissionable material was still required for an atomic explosion. He discussed the critical-mass concept on the basis of geometry, indicating the need of a high volume to surface ratio for an atomic explosion to occur. Dr. Smyth did not mention the quantity of material, but it is clearly a factor. It may be inferred that for fissionable material of a given density and shape the critical mass is a fixed constant. However, if it is possible to increase the density (as for example was done in the explosion of the Nagasaki bomb[1]), the critical mass would be reduced. The extent to which this reduction could be achieved practically remains unknown.

AEC PATENT COMPENSATION

The U. S. Atomic Energy Commission Patent Compensation Board made its first award since it was established in April 1949, by granting Westinghouse engineer Cyril E. McClellan $7,500. However, the statement issued by the board made it seem as though the award was made as a prize for encouragement of research rather than as the just compensation for a valid patent claim.

Mr. McClellan's patent claim covered the design of an apparatus and method for separating isotopes of different mass. The technique is based on the fact that lighter ions move more quickly in an electric field.

In what appeared to negate the validity of the patent claim, the Board stated: "While a method employing the same principles has been experimentally tried as a separation process and abandoned by the Atomic Energy Commission, and a similar method and apparatus improved by the Commission staff, is being used in research measurements, no precise evaluation of the potentialities of the applicant's method and apparatus or measure of its importance is possible."

Then, in justification of the award, the Board explained that the disclosure to the Commission "of a concept independently developed is the product of that vast resource of independent research which the Atomic Energy Act seeks to nourish." The Board added that, "it deserves the recognition and stimulation which that Act has provided."

The Board stated that the applicant's own estimate of an appropriate award can have no controlling effect, although the efforts and funds expended by him may fix a minimum base "which should be regarded." "To this we add a modest amount which, together with the professional recognition that the granting of the award should afford, we trust will constitute an incentive to further work and an encouragement to (the) applicant and to others in further carrying out an important purpose of the Act."

NOBEL PRIZES

The 1951 Nobel prizes in physics and chemistry were awarded to four nuclear scientists. The physics prize was shared by Sir John Douglas Cockcroft, 54, of Harwell and Dr. Ernest T. S. Walton, 48, of Dublin University. Two University of California scientists, Professor of Physics Edwin C. McMillan, 44, and Professor of Chemistry Glenn T. Seaborg, 39, divided the chemistry prize. The value of this award was given as $32,517.

The Cockcroft-Walton citation was "For their pioneer work on the transmutation of atomic nuclei by artificially accelerated atomic particles." Cockcroft and Walton produced the first electrical accelerator, a 700,000-volt proton generator in 1932. They then used the energetic protons to produce two helium nuclei from a lithium nucleus.

McMillan and Seaborg won the honor for work in the chemistry of the transuranic elements. In 1940,

[1] Described in Summary of the Rosenberg Trial, *Bulletin*, April 1951, p. 15.

Note to Readers—

News for this section should be sent to Dr. Peter Axel, Department of Physics, University of Illinois, Urbana, Ill. The deadline is the 1st of each month.

McMillan produced and identified element 93 which he named neptunium. He then left for war research in microwave radar, and Seaborg carried on the work. Within several months, he identified element 94, plutonium, which became a crucial part of the atomic bomb. After the war, Seaborg continued to direct the work which led to the identification of elements 95, 96, 97 and 98, americium, curium, berkelium, and californium.

VISAS AND PASSPORTS

A study of the international travel restrictions imposed by the State Department is being made by the Washington Chapter of the Federation of American Scientists. It is known that visitors' visas have been denied to foreign scientists who had been invited to attend international conferences. In addition, passports have been denied to some American scientists who desired to visit other nations.

The purpose of the present survey is to determine the extent and effect of these travel restrictions. (Any relevant information should be sent to the Washington Association of Scientists, 1749 L Street, N.W., Washington 6, D.C.)

EUROPEAN RESEARCH CENTER

Nuclear physicists from twelve European countries met at UNESCO headquarters in Paris on December 17 to discuss further plans for a European research center. The group, which included Nobel Prize winners Niels Bohr, Werner Heisenberg, and Sir George Thomson, were particularly anxious to stop the exodus of young scientists who are being attracted by the superior facilities available in the United States.

However, the research center, whose site is still to be chosen, will not be established for at least several years. The *New York Times* report from Paris presented the following estimates: Another year will be consumed in the $200,000 study phase of the project; it will take five to six years to construct the research facilities which would cost between $15,000,000 and $18,000,000.

ARGENTINE ATOMIC ENERGY

In another bid for world praise and without revealing any relevant information, Argentina's Dr. Ronald Richter held a news conference on December 11. He promised convincing demonstrations within three months and reaffirmed his claim that Argentina already was capable of building large thermonuclear reactors. Dr. Richter also announced that Argentina was negotiating with a "highly industrialized foreign country" for a share in the new invention.

The interview did establish incontrovertibly that, despite rumors to the contrary, Dr. Richter is neither dead nor in prison.

DISARMAMENT

The formal United Nations efforts toward disarmament will be concentrated in a single disarmament commission which replaces both the U.N. Atomic Energy Commission and the Commission on Conventional Armaments. The new group will consist of twelve members, Canada being added to the list of nations belonging to the Security Council: Brazil, Chile, China, France, Greece, Netherlands, Pakistan, Turkey, USSR, United Kingdom, United States.

The establishment of a disarmament commission was about the only important point of agreement that existed between the Soviet Union on the one side and Britain, France, and the United States on the other. Early in December, the Big Four had attempted to reach some compromise by means of closed door conferences,[2] but neither side was able to find any promising common ground.

RACIAL DISCRIMINATION IN AEC

President Truman signed an executive order on December 3 creating a special committee to enforce the regulations forbidding racial discrimination by the government contractors. The AEC is one of the five large contracting agencies that will be represented on this committee. Senator Harry F. Byrd of Virginia denounced the order as a step in a program aimed at destroying all authority of the states.

NEW TREATMENT OF BERYLLIUM POISONING

Announcement has been made of the discovery of "the first successful antidote for beryllium poisoning in animals." Cooperating in the research project were four scientists of Argonne National Laboratory, Chicago: Jack Schubert, Marcia R. White, Asher J. Finkel, and Arthur Lindenbaum.

Only recently has beryllium been recognized as the cause of a slowly developing poisoning, which is especially serious in laboratories where beryllium is used with radium as a source for radioactivity.

The use of aurin tricarboxylic acid (ATA)—a substance effective in the chemical analysis and detection of beryllium and other metals—proved effectively to inactivate beryllium which had entered the body of test animals. It was pointed out that the experiments and results reported were conducted solely with animals and that considerable testing is still needed before ATA can be tried on cases of beryllium poisoning in humans.

APPOINTMENTS AND RESIGNATIONS

Sumner T. Pike, the last of the original (1946) five-man Atomic Energy Commission resigned from his post as of December 15. Mr. Pike's resignation came five months after the Senate had confirmed his reappointment over the negative recommendation of the Senate members of the Joint Congressional Committee on Atomic Energy. Before the Committee's negative action, Mr. Pike had been considered the probable choice as AEC chairman; he had been acting chairman for almost a year following Mr. Lilienthal's departure.

Six United States scientists have recently been appointed by the State Department to serve in overseas posts in Europe. This step puts into effect another of the recommendations of the Berkner report of 1950.[3] Hans T. Clarke, biochemist from Columbia University will succeed Charles S. Piggott as science attaché in London. L. H. Farinholt, another Columbia chemist, will assist him. Appointed to serve in the American legation in Bern, Switzerland, were Lodewyk Lek, a Scripps oceanographer, and Gordon F. Hull, Dartmouth physics professor. New appointees to the staff at Stockholm are anatomist William L. Doyle and industrial chemist Robert L. Loftness.

Dr. Farrington Daniels, professor of chemistry at the University of Wisconsin, was elected to the presidency of the American Chemical Society for the year of 1953. Dr. Daniels has been a member of the faculty at Wisconsin since 1920. He also has been a leading figure in the atomic energy program, having served as director of the Metallurgical Laboratory in 1945–46 and as chairman of the Argonne National Laboratory from 1946 to 1948.

[2] See *Bulletin*, December 1951, p. 380.

[3] *Bulletin*, July 1950, p. 222.

Letters to the Editor

November, 1951

DEAR EDITOR:

I certainly recognize I am no authority and have only the approach of the layman, and therefore I am not fully qualified to express any comment other than within the limitations of my own capacity.

I believe the greatest danger in the atomic development fields is to be found in the apparent desire of the American people to believe that we are in the push-button era or warfare, which we definitely are not. I believe the much-discussed tests from Bikini to Frenchman's Flats of fantastic weapons we hear so much about and, in truth, know so little, have us confused. The American people do not realize that too many of these weapons are still experiments and several years removed from actual production for effective use in a general war.

In the last Congress I was chairman of a special subcommittee on guided missiles and I purposely did not make a report because there was nothing that could be intelligently reported to the public. Of course, I recognize there are two schools of thought in this matter. One believes that we should tell everything in order to scare hell out of Russia. The other school believes that we should keep secret everything in order to baffle hell out of Russia. There is, perhaps, much to be said on both sides of the question, but for my part I am persuaded that the American people should be told as much as possible without revealing such details as might jeopardize our safety.

I believe there has been entirely too much loose talking in this country among people who should be tight-lipped. During my years in Washington I found that the most prevalent disease there is the hoof and mouth disease, and it seems to infect too many people who should have been immune. We should establish a set policy and follow that policy.

I realize how confused we were when I wrote the eye witness story of Eniwetok. I accepted the Atomic Energy Commission as the clearing media for anything said about our Atomic Energy Program. Before I wrote the articles, I discussed the matter with Chairman Gordon Dean and Lieutenant General Pete Quesada at Eniwetok. I thought I was logical in assuming that these two gentlemen were the proper authority on clearance. When I wrote the articles they were read three different times by representatives of the Atomic Energy Commission and every period, colon, and semi-colon checked before publication. In spite of all these precautions there were some individuals including members of Congress, which included members of the Joint Committee on Atomic Energy, who saw fault in the fact that I had written the articles, but who apparently were blind to the fact that they had been cleared by the Atomic Energy Commission. Now if the Atomic Energy Commission is not the proper authority for such clearance, then who is?

Is it any wonder that I am confused by the confusion which exists?

Sincerely yours,

F. EDWARD HEBERT
U. S. Representative
First District, Louisiana

SIRS:

I will contribute to a fund for the mass-analysis of atomic scientists, but not a penny to their justification before the masses!

I am fed up with the atomic scientists' attempt to foist responsibility for their doings on a public which is never consulted in advance about what they do. You are morally responsible for your own thought—as much as Nietzsche or Machiavelli were for theirs.

—(No signature) *

* Received among the replies to a recent *Bulletin* funds appeal.

October, 1951

DEAR EDITOR:

I shall have to cancel my subscription to the *Bulletin*—I can't understand a word of it. Your work, I know, is extremely important. . . .

Very truly yours,
—NAME WITHHELD
Princeton, Massachusetts

November, 1951

DEAR EDITOR:

Your letter has reached us in good order, and many thanks to you.

The magazine is particularly interesting to those of us involved in certain developments in our country. Many of our readers, particularly students, appreciate the *Bulletin* for its dynamic articles.

Of keenest interest to us in the August issue were Dr. Kathleen Lonsdale's "The Ethical Problems of Scientists" and the articles by Mr. Philip Wylie and Dr. Maria Telkes.

Should the magazine be adorned with pictures particularly suited to the contents, it might be better, but this is, of course, up to you.

Our heartiest greetings to you.

We beg to remain, Dear Sir, Yours sincerely,

The Perpustakaan Islam
H. FARID MA'RUF
Chief Librarian

November, 1951

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—NAME WITHHELD
Wausau, Wisconsin

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A main purpose of the* Bulletin *is to serve as a forum of opinion.

Therefore the* Bulletin *invites reader's comments, not only upon its articles, but upon the current developments in science and society.

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